july, 1960

nlgi spokesman

journal of the national lubricating grease institute

Material Handling and Processing Aids in the Manufacturing of Grease
By S. E. HENDRICKS and R. S. STOOPS

Bulk Grease Handling
By C. A. BAILEY

Chassis Grease Sparks Canadian Customer Campaign
By W. R. YOUNG

NLGI GLOSSARY—Definitions of Terms Relating to the Lubricating Grease Industry

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nlgi spokesman

Volume XXIV July, 1960 Number 4

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THE COVER

THIS 24-sheet outdoor poster was part of the showing throughout the Royalite marketing area, in Western Canada. Royalite concentrated on the grease gun and its Regalube 2595 Chassis Grease in every ad medium, including TV, newspapers, radio, direct mail and dealer promotion, and the hand holding the grease gun became a familiar sight throughout Alberta, Canada. For the story on how this company built sales through promotion of the customer's concern for care of his car, read "Chassis Grease Sparks Canadian Customer Campaign" on page 140.

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NLGI PRESIDENT'S PAGE

By H. A. MAYOR, JR., *President*

An Open Letter

Mr. F. R. Hart, Vice-President
National Lubricating Grease Institute
Care, Standard Oil Company
Western Operations, Inc.
225 Bush Street
San Francisco, California

Dear Frank:

It's difficult to realize that our 28th Annual Meeting, the real climax of our NLGI year, is just a short four months ahead of us. We'll be bending an elbow together at that big Early Bird Reception on Sunday, October 30th, 1960, before we know it!

The urge to drop you this note, complimenting and congratulating you for the outstanding job you're doing as our Annual Meeting Chairman couldn't be overcome. It won't be long before you will fully realize what comfort a hard-working, productive, program chairman can render to those most concerned with the progress and well-being of the Institute.

The good report that you rendered at Bedford Springs represented strong assurance for all of our members and associated industry people that it will be a worthwhile, interesting, productive four days in Chicago after the curtain goes up on the meeting.

Keep up the good program work. It's a tough, time-consuming, wearisome task but the grease making industry cannot help but be stronger because of your efforts. Our industry will need all of the strength it can muster for the battle ahead.

Yours very truly,

H. A. MAYOR, JR.
President

Wherever in the world your industrial machinery operates...

Shell Alvania Grease is there

Other outstanding Shell Industrial Lubricants available world-wide

Shell Tellus Oils – for hydraulic systems

Shell Talona R Oil 40 – anti-wear crankcase oil for diesel locomotives

Shell Rimula Oils – for heavy-duty diesel engines

Shell Turbo Oils – for utility, industrial and marine turbines

Shell Dromus Oils – soluble cutting oils for high-production metalworking

Shell Macoma Oils – for extreme pressure industrial gear lubrication

Shell Voluta Oils – for high-speed quenching with maximum stability

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Alvania® Grease offers these performance-proved advantages: (1) It provides safe lubrication at both high and low temperatures. (2) It won't wash out even in locations where water splashing can't be avoided. (3) It has built-in protection against rust and pitting of anti-friction bearings. And because this *one* multi-purpose grease is specially designed to satisfy as much as 90% of industrial grease needs, less servicing time is required; inventory costs are less; and there is less risk of misapplication.

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Future Meetings

SEPTEMBER, 1960

11-16 American Chemical Society, 138th National Meeting, headquarters undecided, New York.

14 API Division of Marketing, lubrication committee meeting, Hotel Traymore, Atlantic City, New Jersey.

14-16 National Petroleum Association Annual Meeting, Hotel Traymore, Atlantic City, New Jersey.

18-20 IOCA 13th Annual Meeting, Hotel Moraine, Highland Park, Ill.

18-21 ASME Petroleum Mechanical Engineering Conference, Jung Hotel, New Orleans.

OCTOBER, 1960

9-13 ASTM, Committee D-2 meeting, Mayflower Hotel, Washington, D. C.

10-12 API Division of Marketing, marketing research committee, Baker Hotel, Dallas.

17-19 ASME – ASLE Lubrication Conference, Statler Hilton Hotel, Boston.

OCT. 30 - NOV. 2 NLGI Annual Meeting, Edgewater Beach Hotel, Chicago

NOVEMBER, 1960

2 Packaging Institute, petroleum packaging committee meeting, headquarters undecided, New York.

3-4 SAE National Fuels and Lubricants Meeting, Mayo Hotel, Tulsa, Okla.

14-16 API 40th Annual Meeting, Conrad Hilton, Palmer House and Congress Hotels, Chicago.

27-Dec. 2 ASME Annual Meeting, Statler Hilton Hotel, New York.

JANUARY, 1961

9-13 Society of Automotive Engineers Annual Meeting, Cobo Hall and Convention Arena, Detroit.

OCT. 29 - NOV. 1, 1961 NLGI Annual Meeting, Rice Hotel, Houston, Tex.

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Harshaw Lead Bases are offered in three concentrations to suit your particular needs:

Liquid 30% Pb	Liquid 33% Pb	Solid 36% Pb

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Transfers grease 200 Pounds per minute!

(...and cleans drum "whistle clean")

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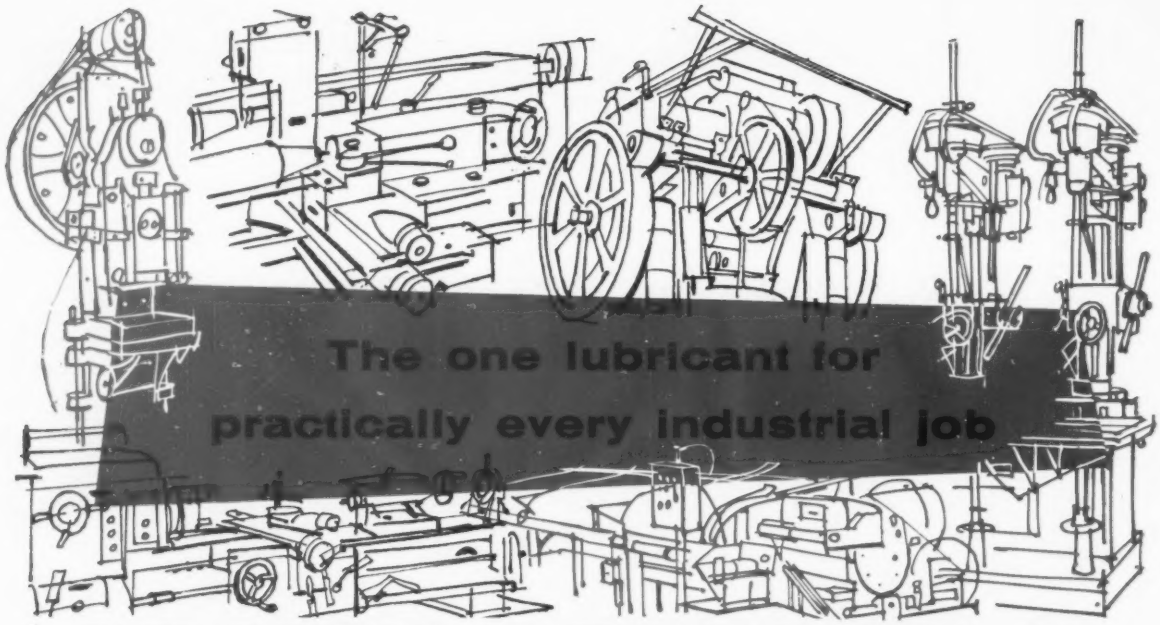

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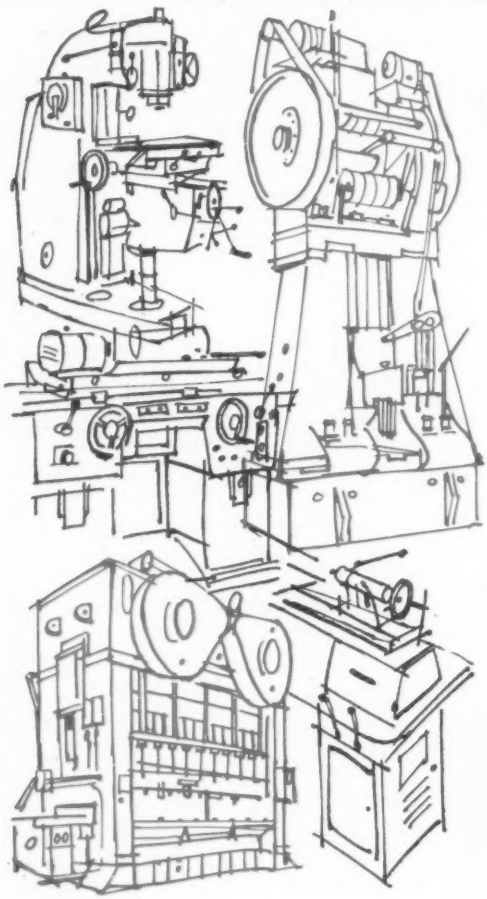

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Atlantic Refining Company of Brazil, Rio de Janeiro

News About NLGI

Walker's (Century Oils) Limited Joins NLGI

Walker's (Century Oils) Limited at Hanley, Stoke-on-Trent, England has affiliated with NLGI in an Active member capacity. Mr. C. H. Mitchell, director, will act as both Company and Technical representative to the Institute. The firm manufactures and markets Century brand lubricants.

Sydney Bevin

Mr. Sydney Bevin, long-time member of the NLGI Board of Directors and a former president of the Institute, died May 29. He had been chief engineer for Fiske Brothers Refining company until his retirement a few years ago, and was an NLGI Honorary Member.

Elected to the Board of Directors in 1940, Mr. Bevin served through 1948 and during that time chair-

S. BEVIN

manned three committees, while serving on twelve others. He was vice-president in 1942 and president in 1943.

In 1955, Mr. Bevin was elected to the position of Honorary Member in the Institute, in recognition of his service to the industry and his contributions to the Institute in its formative years.

Board Decides to Change Location of Annual Meetings

Acting upon the requests expressed by members of the Institute, the NLGI Board of Directors has decided to modify the Annual Meeting location tradition. Instead of meeting four consecutive years in Chicago, then switching to another city on the fifth year, NLGI will now meet in Chicago on even numbered years, in cities located close to the industry on the odd numbered years.

Thus, the 28th Annual Meeting will be held at the Edgewater Beach hotel at Chicago this October, while the 29th Annual Meeting will be at the Rice hotel, in Houston, Texas, in 1961.

The 1962 and 1964 sessions will be in Chicago, at the Edgewater Beach, while 1963 will be at a site to be chosen by the Program Committee and the Board of Directors at the September Board meeting.

Technical Committee Column

CHAIRMAN L. C. BRUNSTRUM
Research & Development Dept.
Standard Oil Company (Ind.)

In reviewing the progress of the Technical Committee at midyear, it would appear that the major effort of the 1959-60 season may be that of improving communications. To date the program has been spontaneous, with suggestions coming from the General Manager and the officers, as well as our own ranks. Here are some of the accomplishments of the first half and suggestions for the second.

This year, for the first time, the detailed reports of the subcommittee chairmen were appended to the minutes of the annual meeting. The additional details should assist the steering committee in its functions of management and planning and provide absent members with a more elaborate picture of the annual meeting.

Because the single copy of the minutes of the annual meeting circulate in some organizations slowly or not at all, a short form was published in the NLGI SPOKESMAN. The objective was to reach more people at an earlier date.

More definite scheduling has been arranged for the subcommittee meetings that will be held during

the 1960 annual meeting. Most of the subcommittees will meet in assigned space on Wednesday morning and the general meeting will start one hour later than in 1959. Objectives are better attendance, less confusion and a better opportunity for visitors, including Board members.

Because technical subcommittees now review some papers in the process of organizing sessions, the Editorial Committee has been asked to develop a Paper Review Form, somewhat along the lines of the ones used by ASLE and ASME. This will insure that the policies of the Editorial Committee are followed in these early reviews. It can also be used to inform prospective authors of NLGI requirements.

Along this same line, the Procurement Committee was requested to develop a list of suggested mathematical symbols for NLGI papers. Subsequently it was learned that ASA will consider adoption of the ASLE list. Theirs is a good list but needs some revision for grease work. Comments of the members will be welcomed by Mr. C. J. Boner.

Finally, a more detailed report for the next midyear is under consideration. The chairman of the Technical Committee must report to the Board four times each year. It is proposed that the May report be based on the written reports of the subcommittee chairman and published in the NLGI SPOKESMAN. This should improve communication to both the Board and the membership.

But communication is a two way street; we must get ideas and opinions from the members of the Technical Committee as well as to them. To date the score for this year is as follows:

Comments covering minutes of the annual meeting...	2
Comments covering short form of the minutes.....	0
Unsolicited comments from members.....	0

The Steering Committee needs and welcomes your opinions. To facilitate comments, a form is being considered. This self-addressed sheet or card can be written long hand (or typed), one subject per card. Let us know what you think of this system or any of the other communication ideas you may have.

SERVICE AIDS

Send Orders to: National Lubricating Grease Institute, 4638 Nichols Pkwy., Kansas City 12, Mo.

REPRINTS — From the NLGI SPOKESMAN are available at low cost. Page forms are left standing for three months, company imprint or advertising arranged.

BALL JOINT BOOKLET — "Recommended Practices for Lubricating Passenger Car Ball Joint Front Suspensions." The latest aid in application, created by experts in the field and designed for use in the station. Twelve pages, easy to read, with large illustrations throughout. Twenty-five cents a copy with quantity discounts—company imprint arranged.

NLGI MOVIE — "Grease, the Magic Film," a 16-mm sound movie in color running about 25 minutes, now released. First print $300, second and subsequent orders $200 each (non members add $100 to each price bracket).

WHEEL BEARING MANUAL — "Recommended Practices for Lubricating Automotive Front Wheel Bearings." More than 170,000 copies of this booklet have been distributed throughout the world. Now in its sixth printing. Sixteen pages, with more than 40 illustrations. Twenty-five cents a copy, with quantity discounts — company imprint arranged.

BONER'S BOOK—Manufacture and Application of Lubricating Greases, by C. J. Boner. This giant, 982-page book with 23 chapters dealing with every phase of lubricating greases is a must for everyone who uses, manufactures or sells grease lubricants. A great deal of practical value. $18.50, prepaid.

VOLUME XXI—Bound volume of the NLGI SPOKESMAN from April, 1957 through March, 1958. Contains 34 articles and features dealing with lubricating greases and gear lubricants . . . $7.50 (NLGI member price) and $10.50 (non-member) plus postage.

VOLUME XXII—Bound Volume of the NLGI SPOKESMAN from April, 1958, through March, 1959. Contains 31 articles and features dealing with lubricating greases and gear lubricants . . . $7.50 (NLGI member price) and $10.50 (non-member) plus postage.

VOLUME XXIII—Bound Volume of the NLGI SPOKESMAN from April, 1959 through March, 1960. Contains 36 features on every phase of the lubricating and fluid gear lubricants industries . . . $7.50 (NLGI member price) and $10.50 (non-member) plus postage.

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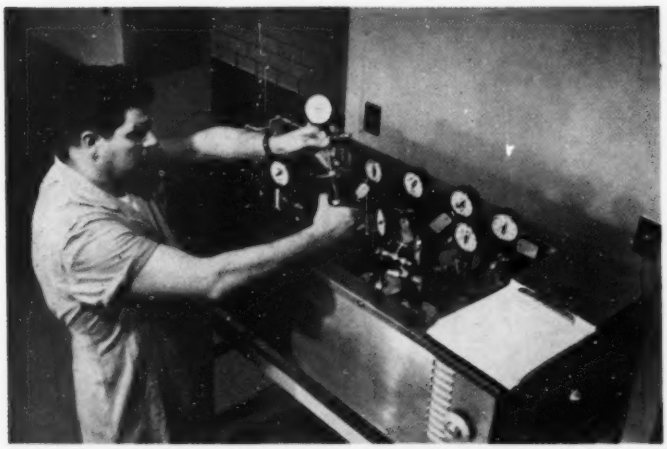

The oil constituents in greases are carefully controlled. Here chemist determines oxidation resistance of oil samples used in grease manufacture.

The years ahead represent a giant challenge to the best efforts of American industry. The answer lies in research by men with a driving scientific curiosity, working with testing equipment engineered to cope with stringent performance specifications.

To step up its research facilities, International Lubricant has recently completed a great new Research Laboratory. Here, highly trained chemists and engineers, cooperating with farsighted grease marketers, have rededicated themselves to work with untiring zeal so that no nation anywhere can surpass our efforts or our products in the field of lubrication. We invite your inquiry.

Specially developed analytical procedures are used to test the quality of lubricating oils from which International greases are produced.

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Manufacturers of top quality lubricants: Aviation • Industrial • Automotive • Marine

With Research Comes Quality, With Quality Comes Leadership

ANNUAL MEETING, 1960

Tentative Titles, NLGI 28th Annual Meeting
Edgewater Beach Hotel, Chicago, October 30—November 2

NLGI Annual Meetings continue to get larger and the 28th is no exception . . . there will be more papers presented than ever before and each has been initiated because of member interest and requests. A full day of concurrent sessions on Tuesday, November 1, will offer an unusual program devoted to industry facets from both the marketing and technical standpoints. The general session on Monday, October 31, will be of interest to the entire membership. Titles listed below are tentative and will be confirmed in later issues of the journal. The line-up is as follows:

Sunday, October 30

"Mr. and Mrs. Early Bird Reception" sponsored by 26 Associate member firms

Monday, October 31 (*General Session A*)

Address of Welcome
Keynote Speaker
Selling the Lubricating Grease Market

DUTCH TREAT LUNCHEON

Monday, October 31 (*General Session B*)

NLGI ANNUAL BUSINESS MEETING

Why Wire Rope Lubricants Are Special Compounds
New Grease Plant Layout
What's Ahead in Farm Machinery Lubrication
A Review of NLGI Fellowship Activity

Tuesday Morning, November 1 (*Marketing Session A*)

New Developments in High Temperature Grease
Aero/Space Grease Requirement Trends
Lubrication of Nuclear Power Plants
Future Package Trends and Designs for Lubricating Greases

Tuesday Afternoon, November 1 (*Marketing Session B*)

Lubricating Grease Requirements of 1961 Cars
Centralized Lubricating Systems
A Rapid Method for Predicting the Flow Properties of Greases
Lessons to Be Learned from the Cato Grease Plant Fire
Novel Quality Control Tests for Use in Grease Plants
1958 Federal Food Additives Amendment

Tuesday Morning, November 1 (*Technical Session A*)

The Permeability of Lubricating Grease
Structural Changes and Phase Transitions in Lithium Grease
Electron Microscope Examination of Thin Film Sections of Lubricating Greases
A Rheological Equation for Greases

Tuesday Afternoon, November 1 (*Technical Session B*)

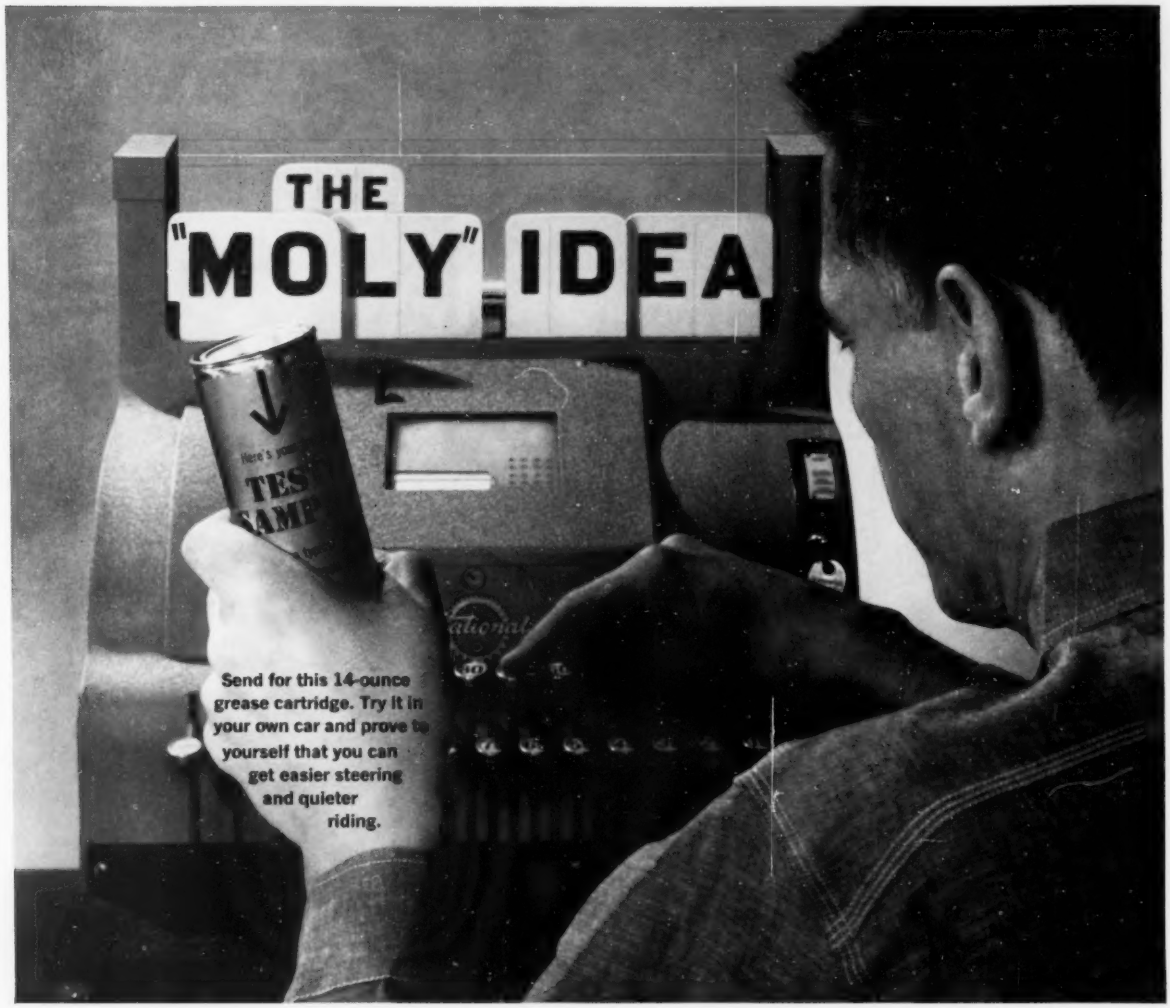
Oxidation of Lubricating Greases
NLGI Fellowship Report
Report on Fellowship Activities
Question and Answer Period

ANNUAL SOCIAL HOUR
ANNUAL BANQUET

Wednesday Morning, November 2

Subcommittee Meetings
NLGI TECHNICAL COMMITTEE MEETING
Reports of Subcommittees

F. R. Hart (Standard of California) is chairman of the program committee, assisted by S. C. M. Ambler (British American), C. L. Johnson (Jesco), W. A. Magie, II (Magie Brothers) and T. F. Shaffer (Shell).


THE
"MOLY" IDEA
Send for this 14-ounce grease cartridge. Try it in your own car and prove to yourself that you can get easier steering and quieter riding.

Grease sells gasoline!

Grease can increase service station traffic and sales. Grease can sell gasoline! • That's the "MOLY" IDEA. • And it works.

Oil marketers have tried it. They've recorded increases in service station, in traffic, gas sales, grease sales, and TBA sales. So they've repeated it. And made "MOLY" grease their standard product.

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Because smart marketers know that a new product is their big opportunity for dramatic promotion. The new product is their own brand grease with Molysulfide added, giving them the first grease in years they can talk about and promote . . . the lube job a customer can appreciate with his hands, his ears, and his pocketbook. Because "Moly" grease makes steering easier, riding quieter, and it reduces wear. Most important . . . you can translate these technical benefits into your customer's language!

Have you looked into the sales potential of the "MOLY" IDEA? Have you counted up the benefits to your company, your dealers, and your customers? Have you thought about the opportunities for local promotion and increased traffic that this new grease can give you? If not, remember: "Moly" grease has grown faster than any other product in the history of the grease industry. You can profit by this growth.

We'll be happy to send you the facts. Write for details supporting THE "MOLY" IDEA, to Climax Molybdenum Company, a Division of American Metal Climax, Inc., 1270 Avenue of the Americas, New York 20, N. Y.

CLIMAX MOLYBDENUM COMPANY

A division of American Metal Climax

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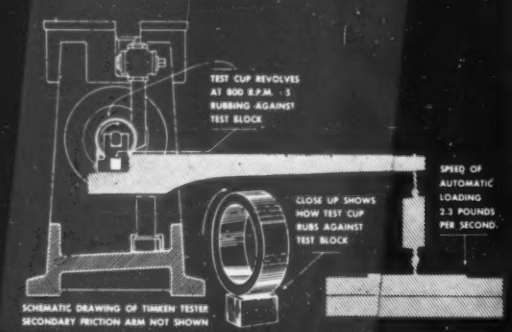
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SOUTHWEST Good GREASE

Presented at the NLGI 27th annual meeting in New Orleans, October, 1959

Material Handling and Processing Aids in the Manufacturing of Grease

By: S. E. Hendricks

R. S. Stoops

International Lubricant Corp.

IT IS THE PURPOSE of this paper to present to the NLGI membership unique designs of equipment which International Lubricant has found helpful in the production and packaging of lubricating grease.

The particular designs to be discussed are:

1. A kettle vent
2. Low rpm kettle drive
3. Grease strainers
4. Handling of graphite and zinc dust
5. A method of closing converted open top drums
6. Bulk movement of grease to small packaging operations

Kettle Vent

A very effective kettle vent, as shown in Figure 1, was designed many years ago by our vice-president. It features a troughed offset to catch falling condensate. A small blower jets air up the stack thereby creating a draft.

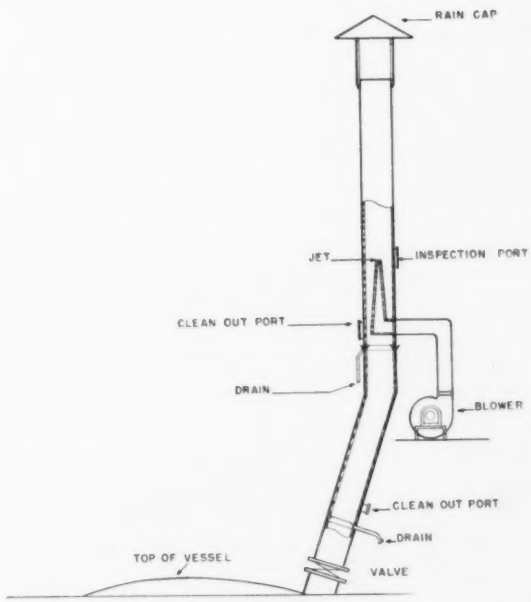

FIGURE 1—Kettle vent.

The advantages of this construction are threefold: 1. A smaller diameter blower may be used; 2. there are no moving parts in the vapor stream that require cleaning; and 3. the condensate is trapped in the troughs and cannot fall back into the kettle.

Low RPM Kettle Drive

An extremely low scraper speed was desired in the manufacture of a particular grease. In one kettle at our plant, the paddles are driven by a 40-hp, 1800-rpm motor through a 60/1 reduction gear. In lieu of installing expensive gears and shafts that would stand the high torque, the latter was kept in the same magnitude by turning the paddles with an appropriate 5-hp gear head motor at a low rpm, without altering the original reduction gear and existing shaft system.

The sketch in Figure 2 shows a small gear head motor which is coupled through the doubled ended shaft of

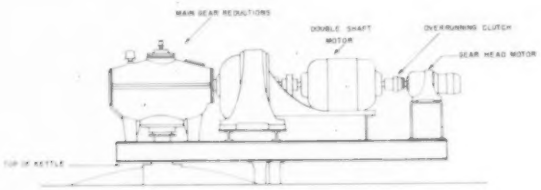

FIGURE 2—Low rpm kettle drive.

the 40-hp motor with an overrunning clutch. This allows the small motor to stop when the large motor is in use.

Grease Strainers

An effective method of product straining is a "must" in modern grease manufacturing. Two general types of strainers are in use at International; namely, the bucket and open-end types.

The bucket type strainer can be made in practical sizes ranging from two inches in diameter to eight inches and with lengths up to three diameters. The open end type may be made larger because they are more easily cleaned and can be pulled from the strainer housing with less effort.

A typical bucket screen holder and housing is shown in Figure 3. The housing consists of a piece of pipe that has an open flanged end, a welded bottom, a seat to contact the flange of the screen holder, an inlet at the top for the product to flow through the open end of the holder and an outlet below the seat of the housing. The holder is made by drilling 1/8-inch holes in a section of pipe that has a flanged top and welded bottom. The holes in the pipe are connected by a series of 1/8-inch grooves on the inside of the pipe. This allows the prod-

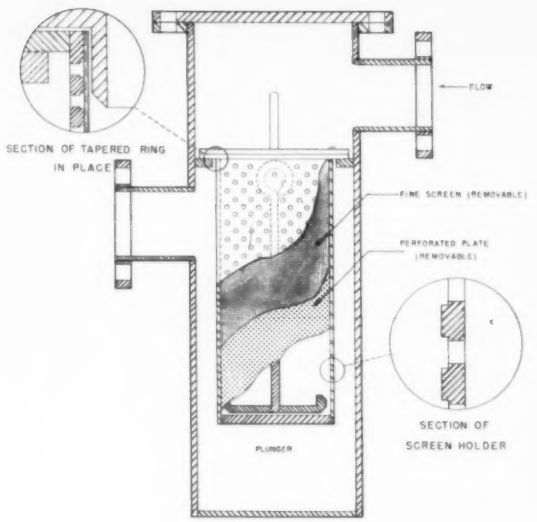

FIGURE 3—Bucket strainer.

uct a passageway through the screen and out the holes. A steel plunger is made by matching a barrel shaped piston slightly smaller than the diameter of the pipe. A flanged tapered ring fits inside the holder and is held in place. The screens are cut to sufficient length to insure at least a two inch lengthwise lap when placed

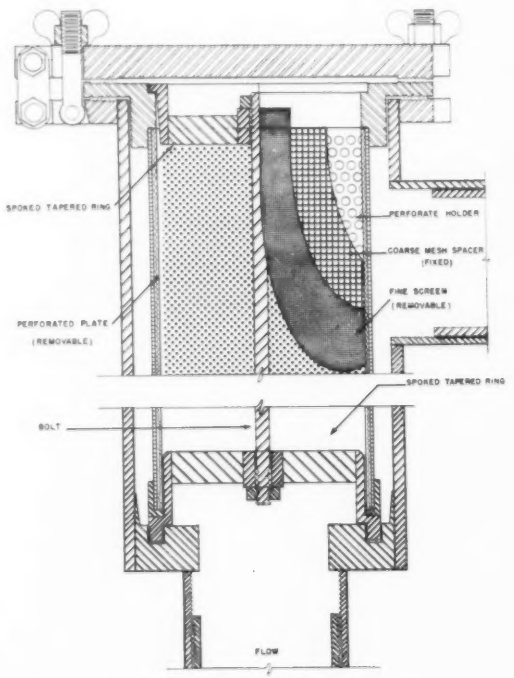

FIGURE 4—Open end strainer.

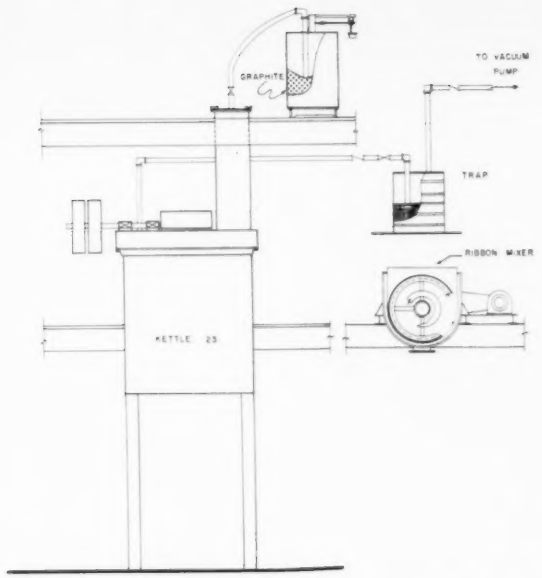

FIGURE 5—Handling of graphite and zinc dust.

inside the holder. To doubly insure against leaks, another screen or perforated sheet is used with the laps opposite.

The strainer is assembled by placing the screens in the holder and forcing the piston to the bottom. The tapered ring is inserted and secured with cap screws. The holder is dropped into the housing, and after closing the flanged opening, the strainer is ready for use.

Figure 4 shows an open end holder which is an adaptation of the bucket type. The holder is made from rolled, perforated plate. The strainer screens are held away from the plate by a very coarse mesh spacer. The screens are held tight against the holder by spoked tapered rings at top and bottom. The entire assembly is held together with a long bolt.

The housing consists of pipe section with a machined groove in the bottom that fits the screen holder. The holder is placed between two gaskets to insure a tight fit when the hinged top flange of the housing is bolted down. The product is pumped into the bottom of the housing through the screen and out through a side opening.

There are several advantages to this type of screen versus the conventional welded type:

1. It can be quickly dismantled for cleaning.

2. The mesh can be quickly and economically replaced or changed from one size to another by plant labor.

3. The screen can expand and contract without placing undue strain on the fine wire mesh. Formerly, the useful life of a screen was very short due to the weld which held it rigidly in place. A slight rip at any point, of course, made the screen useless.

Handling of Graphite and Zinc Dust

A common problem of all grease manufacturers is API pipe thread lubricant. This compound contains 68 per cent fillers, consisting of copper, zinc, graphite and lead. The two troublesome items are graphite and zinc. Graphite, when handled in relatively large quantities, becomes air borne and settles throughout the grease plant.

The sketch in Figure 5 shows the method used to solve this problem. A closed kettle containing the base grease is evacuated. The graphite is sucked from its container through a rubber hose into the kettle. To prevent carry-over of graphite dust into the vacuum pump, an oil trap is used. The grease in the kettle is stirred under vacuum with the graphite until a paste results. This paste is then pumped into a ribbon mixer where the other ingredients are added.

The helical tips of the blades in the mixer are made of neoprene. This insures positive scraping and discharges the product from the vessel without the use of an external pump. Zinc tends to galvanize metal even in a grease suspension at points of high shear such as is encountered in pumps. The ribbon was adapted to convey the finished product out of the vessel by reversing its rotation.

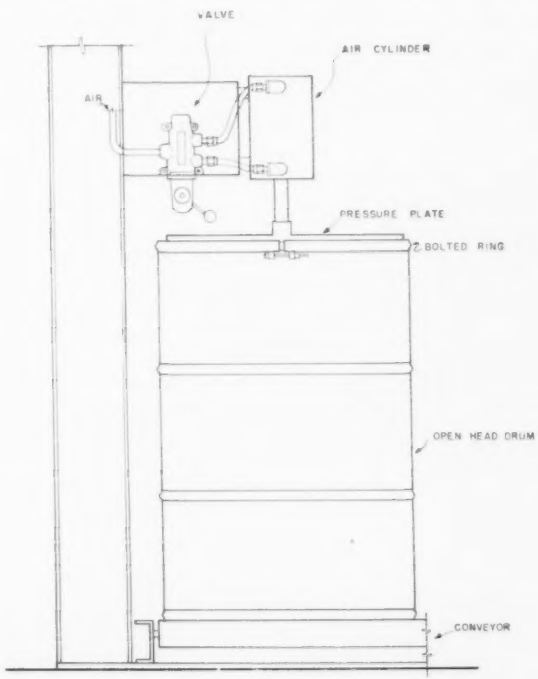

FIGURE 6—A method of closing converted open top drums.

A Method of Closing Converted Open Top Drums

Figure 6 shows an effective aid for closing reconditioned open top drums. The uncovered drum is conveyed under a piston type air clamp. The operator places a foam rubber gasket inside the cover of the drum and positions the lid on the container. The clamp is actuated by opening an air valve. This allows the piston to force the lid down on the container, and tightly compresses the gasket. The operator is then free to bolt the cover ring.

Bulk Movement of Grease To Small Packaging Operations

In grease plants, small orders and the packaging of plastic tubes, cartridges and small containers present a problem. The rate of fill is relatively slow and the point of fill is located preferably away from the point of manufacture. To convey grease through pipe lines is not practical where many grades and small quantities are involved. To avoid these difficulties, grease is transported from the manufacturing to the packaging area in a 4000-lb. tank carried by a fork lift truck. This is shown in Figure 7. This tank or "super drum" is discharged from the top by means of a pump capable of moving the grease at a rate of 150 lbs. per minute. This pump is a direct acting piston type, air actuated, two-to-one ratio, mounted on a follower plate with the suction end in contact with the grease. The follower plate is sealed to the container walls with a 2½-inch tubular vinyl O-ring. When the vessel is empty, the operator can lift the pump back to the top by introducing air under the follower plate.

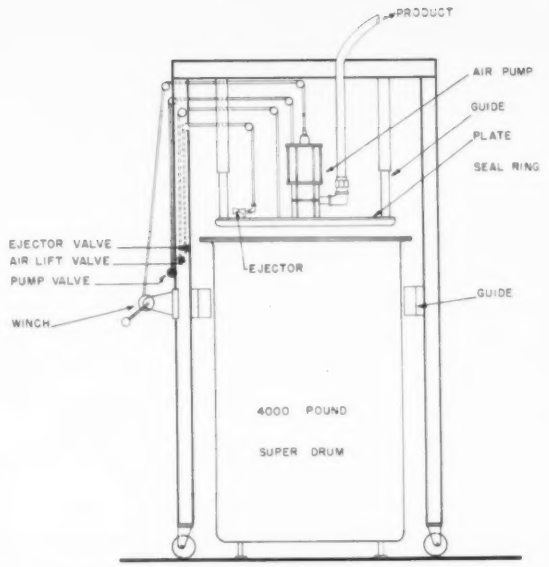

FIGURE 7—Bulk movement of grease to small packaging operations.

A hose is connected from the pump discharge to the packaging equipment. A "Y" at the pump permits introduction of a neoprene ball into the hose so that the material in the hose can be displaced by a different one.

The design and/or ideas of equipment now in use at our plant were in the most part accomplished by International Lubricant's personnel. The strainers are adapted from Shell Oil company's plant at Martinez and the drum clamp is a copy of one used by the Port Drum company at Port Arthur, Tex. ■

S. E. Hendricks *graduated from Georgia Institute of Technology with a BS degree in chemical engineering in* 1934. *Employed as a sugar chemist for the Southcoast Co. his first year out of college, he worked for Pan Am Petroleum Corp. as a tester in the laboratories from* 1935 *to* 1938. *He was associated with Charles Martin & Co. as a petroleum inspector for four years, before joining International Lubricant Corp. as an oil chemist in* 1942. *Appointed superintendent of the grease plant in* 1944, *he returned to the laboratory a year later to assume the post of chief chemist. In early* 1946, *Mr. Hendricks was made technical assistant to the export department. Later that year, he was appointed general superintendent, the position he now holds.*

About the Authors

R. S. Stoops *received his degree in mechanical engineering from Georgia Institute of Technology in* 1941. *He went to work for International Lubricant Corp. the same year, working in the laboratory. After less than a year, he was called into the Army where his final assignment was twenty-two months in the Southwest Pacific area. On his return to International in* 1945, *Mr. Stoops was appointed to the newly-created position of plant engineer with responsibility for an expansion program.*

Dispensing Symposium—IV

Bulk Grease Handling

By: C. A. Bailey, National Tube Div., United States Steel Corp.

Presented at the NLGI 27th annual meeting in New Orleans, October, 1959

HOW CAN the lowest possible grease cost be obtained? The obvious answer lies in bulk grease handling; the grease must be moved from the grease kettle to the bearing with the least amount of handling. Using this concept, a new slogan is born—Grease kettle-to-bearing!

The transition from the use of black oils in steel plants, through the use of various base soap greases, to the current use of multi-purpose greases has required accompanying changes in the methods of handling the lubricants. In 1924, the use of black oil was widespread throughout the steel industry; one of the principal steel producing plants used 75,000 gallons per month. Bulk oil arrived at the plant in tank cars and was stored at a central station from which it was trucked to the various departments. In the departments, the oil was applied to the machinery by hand.

In the early 1930's, centralized lubrication systems came of age; with increasing installations of centralized grease lubrication systems, the volume of hand oiling declined until, in 1945, the use of black oil became obsolete in steel plants. Between the early 1930's and the mid 1940's, black oil was being replaced by an array of various base soap greases. These greases were transported to the plant in drums of various shapes and sizes, stored in a central area and trucked, as was the case with oils, to the consuming departments; the improvement, naturally, was in the method of application within the departments, but the grease drums created a storage problem while the variety of greases presented an inventory problem.

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Problems

An evolution occurred in the lubrication field at this point; multi-purpose greases were developed. The conversion to large quantities of this type grease marked a major step in steel mill lubrication. A second major step was marked by the acceptance of the standardized 400 lb. container. As a result of these developments, relatively large quantities of one grease in a standard container could be purchased; therefore, both developments did ease the inventory and storage problems somewhat. But neither development eliminated the need of moving the lubricant twice; once from the supplier to the plants' central storage area, then from storage to the consuming department. Thus, the lowest possible grease cost still had not been obtained. In addition, the standardized 400 lb. grease

drums presented—and still present—problems in the following areas:

1. Central storage—most oil houses are not designed for drum storage.
2. Departmental storage—consuming departments must contend with the housekeeping features of drum storage.
3. Collection and disposal—plants must often operate a separate department to handle empty drums.
4. Residuary grease—frequently 5 to 10 per cent of the grease remains in the bottom of the drum.
5. Total cost—the over-all lubrication cost includes the grease drum cost as a factor.

For many years plants endured the problems that evolved from the use of drums as necessary evils, but few asked why. Why, indeed, did they and must they be endured? Maybe plant personnel accepted the prevailing thought that grease could not be moved, except by using special pumping equipment that operated on small quantities; after all, their experience in the plant exposed them only to centralized lubrication systems which dispensed relatively small volumes under high pressure. Or maybe we all were complacent in the thought that the standardized 400 lb. container was the optimum for bulk grease handling; after all, we now had uniform containers that did ease the storage problem somewhat. Then again, the follower plate did work; maybe it was an integral part of bulk grease handling. But these are conjectures about the past; what about the present and future of bulk grease handling?

Solutions

Before any avenues could be opened to improved methods of handling bulk grease, some road blocks had to be removed. Blocking the main avenue to any solution, was the plants' notion that grease could only be moved in small quantities by the use of special pumping equipment. In our search for a better way, we had overlooked the obvious; finally, we went outside our own experience to another group of engineers that move grease in bulk. Yes, we went to the grease makers. We

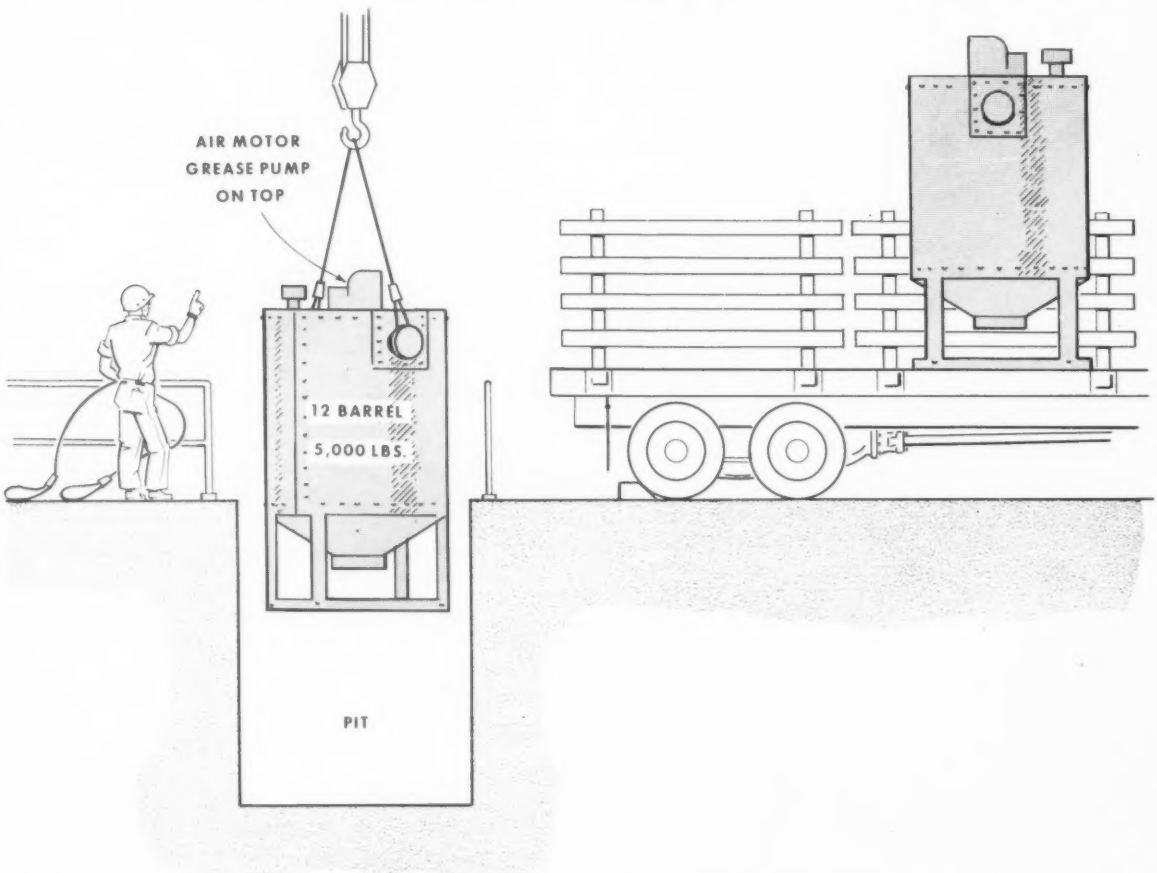


FIGURE 1—Grease is delivered in portable 5,000 lb. containers to the U. S. S. Gary Sheet and Tin Mill plant.

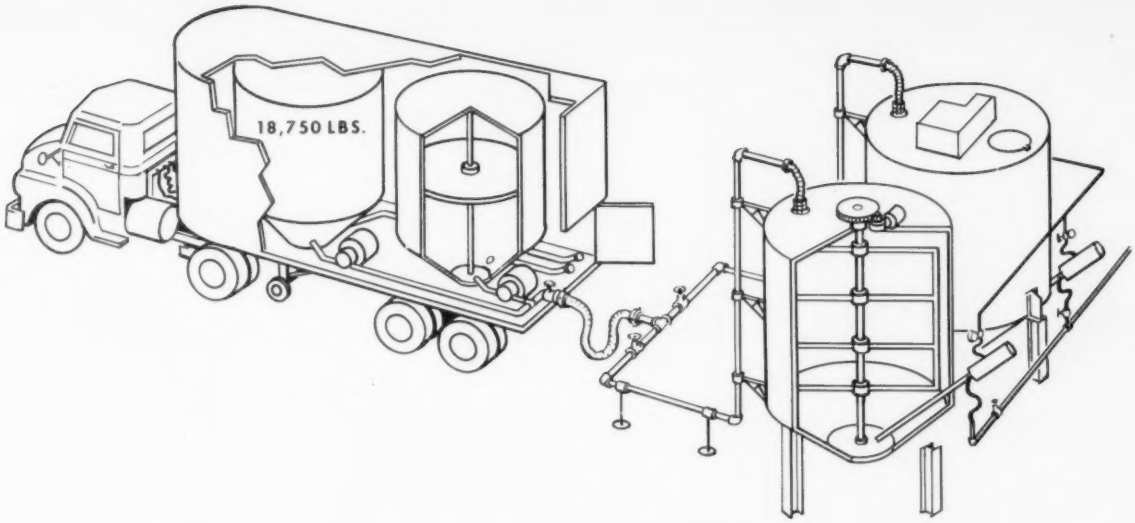


FIGURE 2—The U. S. S. Gary Steel Works has grease delivered in two 18,750 lb. transport containers.

found them moving a high volume of grease under low pressure by using a gear type pump; this method we could use as a main avenue . . . if we could expand our notion of a bulk container. In this instance, the obvious road was not overlooked since we could change container designs and dimensions. The time came to remove the last road block; whenever and wherever possible, we would not use the follower plate. Now let's look at the plants' avenues to see how far we've come along the way toward improved methods of bulk grease handling.

I. Portable Containers

A. At the U. S. S. Gary Sheet and Tin Mill, grease is delivered to the plant in portable 5,000 lb. containers, Figure 1. (The capacity of this container was determined by the average amount of grease consumed by the roll shop in a week.) A crane lifts the container from the truck bed and moves it into storage; at the present time, the containers are stored on the roll shop floor, but pit storage is being considered as a means of obtaining additional floor space. The air-motor grease pump mounted on top of the container has an elongated tube that reaches the bottom of the container; with this elongated tube, grease at the bottom of the container can be pumped. Experience has shown that no residuary grease will remain in the container if the container is jarred slightly; therefore, there is no need for a follower plate, either in the illustrated standard design container or a square container that can be fabricated by a roll shop. (The first containers used at the Gary Sheet and Tin Mill were square and were fabricated by the roll shop. Later containers used a standard design and were fabricated for the mill by the standard products department of the U. S. S. American Bridge Division.) The problem of residuary grease is also eliminated in another manner; since they are portable, the containers are weighed upon entering and leaving the plant. Residuary grease is determined by taring; the plant can then receive credit for any residuary grease in the container when it leaves the plant. As one container of grease is consumed by the department, another container is moved into position to replace it.

Although the standard design container was made especially for other commodities, the containers and the method used at Gary Sheet and Tin appear to be practical for the bulk movement of grease. This method calls for both the movement and storage of bulk grease.

B. Inland Steel Co. utilizes three 4,000 lb. portable containers in a universal slabbing mill. The containers are manifolded in central storage. Four air-operated grease pumps are used to empty the containers into a header line serving the reservoirs of the centralized lu-

FIGURE 2-A—A tractor trailer carries the big containers.

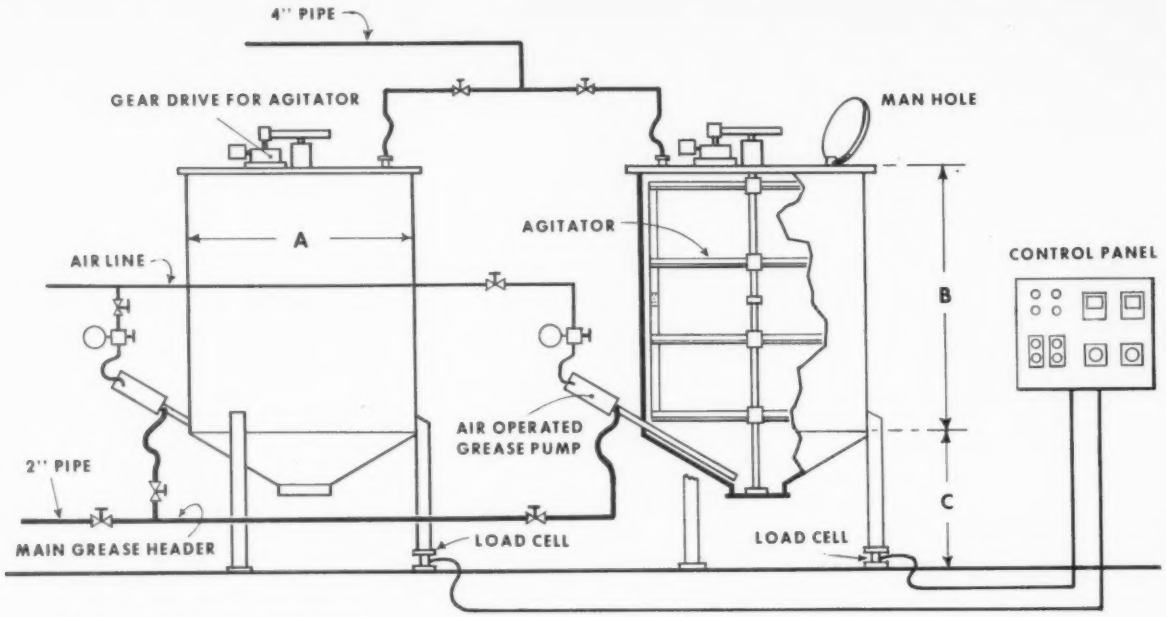


FIGURE 3—Grease storage containers.

bricating system. Normally, one container and two pumps are used for operating purposes; a second container and two pumps are stand-by reserves. The third container, when empty, can be released to the supplier to be refilled. Each of the four containers has a follower plate equipped with a pneumatic seal.

II. Stationary Containers

Grease is delivered to the U. S. S. Gary Steel Works in two 18,750 lb. transport containers that are carried on the bed of a tractor trailer, Figures 2 and 2A. These transport containers are filled and emptied from the bottom since each container has a follower plate; a gear-type pump is used for transferring grease from the transport containers to the plant's stationary containers in central storage. As the grease is transferred to the plant's 20,000 lb. containers (that resemble a grease-maker's kettle, Figure 3), a load cell is activated; a direct-reading control panel connected to the load cell automatically registers the weight of the delivered lubricant providing a means of inventory control. A slow-moving (one rpm) gear-driven agitator removes any air entrained in the grease during the transfer process; the agitator is also used to avoid oil separation during storage and to provide a homogenous blend at all times. Grease from the stationary container is delivered into a 2-inch main-grease-header line by air-operated grease pumps. A man-hole on top of the container is used for inspection.

All stationary grease-storage containers used in the plant are a standard design; this eliminates the need of designing containers for individual installations. The

AVAILABLE GREASE STORAGE CONTAINERS
STANDARD DESIGNS

CAPACITY	NO. OF TANKS	CU. FT.	GAL.	A* DIAMETER	B* HEIGHT	C* STAND
5,000 LBS.	As Reqd.	89	667	54"	60"	30"
10,000 LBS.	As Reqd.	178	1333	72"	72"	36"
20,000 LBS.	2	355	2667	84"	96"	45"
18,750 LBS.	Transport	333	2500	84"	96"	45"

5,000 LB. SIZE IS PORTABLE

* APPROXIMATE DIMENSIONS

FIGURE 4

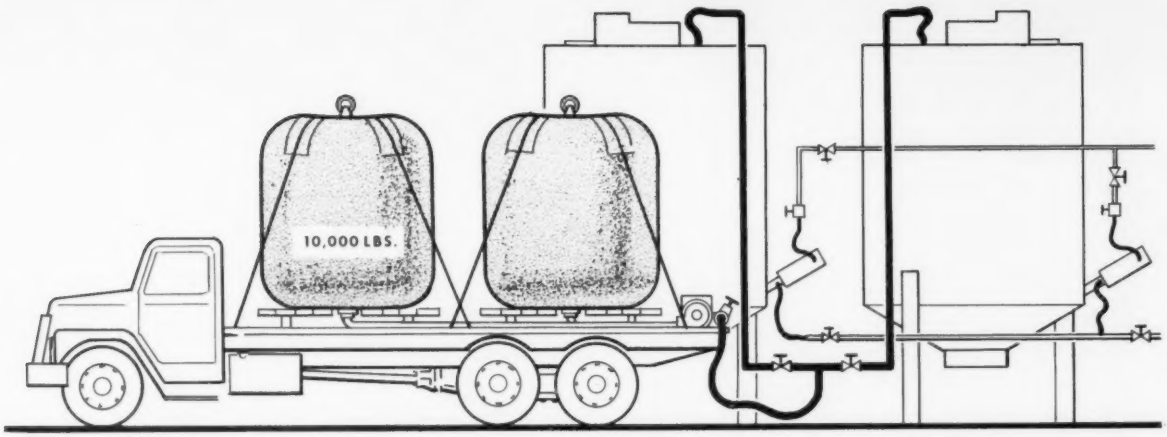


FIGURE 5—Collapsible, rubber-fabric containers have been proposed for the transportation of bulk grease.

capacity of the basic container (5000 lbs.) was determined by the average weekly consumption of the roll shop; larger containers are multiples of the basic unit, Figure 4. In all installations, departmental consumption determines the size of the container to be installed; naturally, a combination of different size containers could be installed, either in central storage or in the consuming departments. For example, one plant is installing various sizes and combinations of sizes in consuming departments; the trailer transport will then fill the stationary containers in the consuming department.

III. Rubber-Fabric Containers

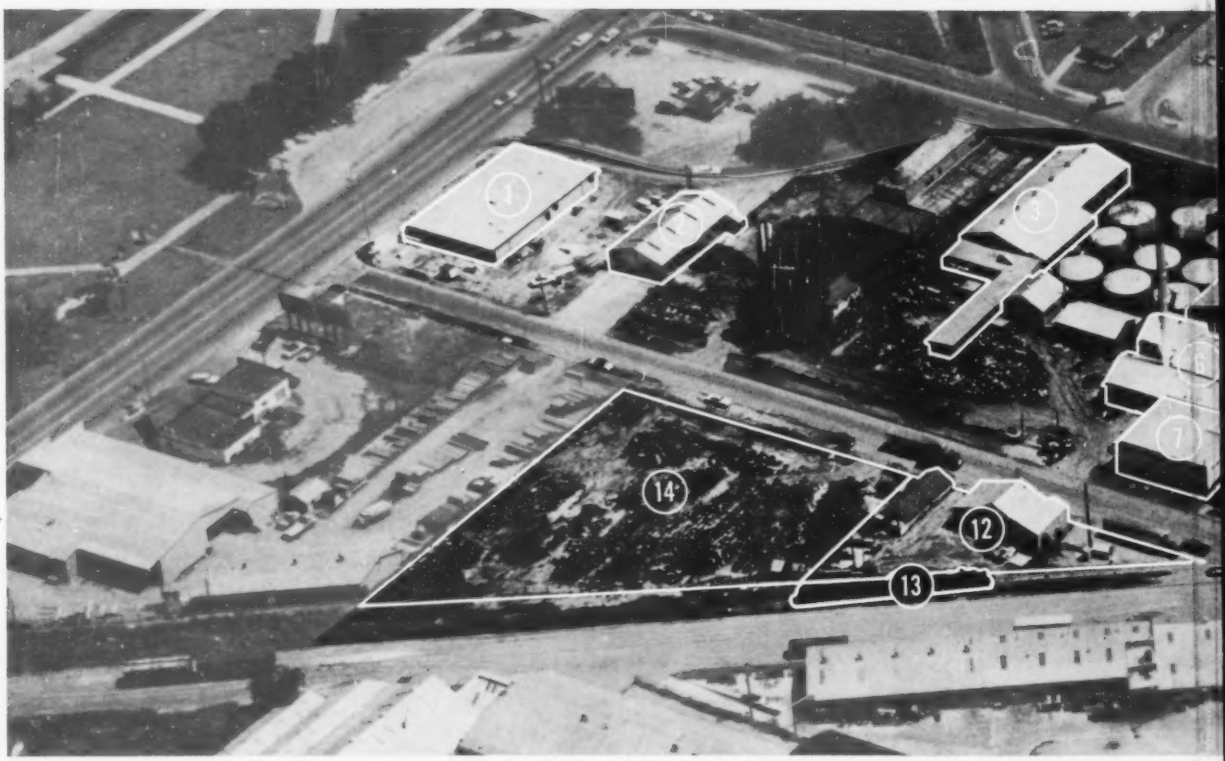
Rubber-fabric collapsible containers are now being marketed for the transportation and storage of bulk materials. One such container is built with several layers of cord fabric and synthetic rubber, vulcanized into one piece (comparable to the construction of a tire sidewall); steel cables are spaced through the interior to provide extra strength for lifting and transporting. Containers are supplied in capacities ranging from 50 to 370 cubic feet. A proposal has been made to use the rubber-fabric containers for the bulk handling of grease. Since these containers are collapsible for return, have a low tare weight and can be handled without too much difficulty, they readily lend themselves to the transportation of bulk grease, Figure 5. However, it would appear that a stationary standard-design steel container would be more desirable for in-plant use since the desirable aspects of rubber-fabric containers are voided after delivery of the grease to the plant. The savings in lubrication cost incurred by the use of the rubber-fabric containers for transportation would be lessened if the containers were retained for storage due to the capital investment of the rubber-fabric container and/or the demurrage on a rented unit.

Conclusion

The utilization of any of the innovations in bulk grease handling by a mill with a high volume grease consumption can reduce lubrication costs and the chances for contamination occurring, while eliminating the need for repeated handling (the present 400 lb. container is handled at least a dozen times between the delivery of the drum to the grease-maker and its eventual sale to a used drum broker). By using the new containers, floor space can be conserved and much of the drudgery involved in departmental and central storage housekeeping can be eliminated; it will no longer be necessary to roll twenty cold grease drums into a warm area before using the contents. In addition, the problem of residuary grease can be controlled since no one will have to lean into a container and scrape it clean. In keeping with the new slogan, Grease kettle-to-bearing, the innovations in bulk grease handling represent the most direct line of material handling. ■

About the Author

C. A. Bailey *graduated from Ohio Northern university with a BS degree in mechanical engineering in* 1936 *and an ME degree in* 1938. *Following graduation, he joined United States Steel Corp. at Gary, Ind., as a practice engineer in the maintenance construction program of cold reduction mills and auxiliary equipment. In* 1941 *he transferred to the research department as mechanical engineer on pilot line electrolytic timing equipment. From* 1942-1945 *he was lubrication engineer at the Gary Steel Works. From* 1945-1950 *Mr. Bailey was occupied by special assignments of operating methods from the general superintendent's staff of Gary Steel Works. In* 1950 *his assignment was to develop a lubricants testing laboratory to provide services for all U. S. Steel divisions. He has contributed to the* Spokesman *previously.*



THE MOST MODERN EFFICIENT PLANT I

It's less than a year since a $1,000,000 fire destroyed 50% of our production capacity . . . yet we're now just four months away from 100% production of the highest quality specialty oils and greases. The above photo details our reconstruction program and partially shows how careful engineering and planning will result in a plant of maximum operating efficiency.

1. New Office Building
2. New Garage and Truck Maintenance Shop
3. Barrel Re-conditioning, Painting, Stenciling
4. Specialty Products Manufacturing Plant
5. East End of 270 Ft. Loading Dock
6. Power Plant and Maintenance Shop

CATO OIL AND GR

Oklahoma City, O

NLGI SPOKESMAN

THE INDUSTRY...READY IN 120 DAYS!

7. New, Modern Laboratory
8. Construction Site of New Grease Manufacturing Building
9. New Oil Manufacturing Building
10. Shipping Dock
11. Warehouses
12. Warehouses
13. Tank Car Loading and Unloading Area
14. Drum Storage Area

Write, call or wire collect . . . we would appreciate the opportunity to send a salesman at your convenience to explain how we can quickly and more efficiently manufacture greases and specialties to your own rigid specifications, custom-packaged under your label.

ASE COMPANY

klahoma

JULY, 1960

TYPICAL station scene with giant ad blowups and window posters that match outdoor showing (right), and street-line "A" frame posters to help sales staff of station with on-the-spot information for the customer's questions (below).

The Regalube Story . . .

Chassis Grease Sparks Canadian Customer Campaign

By:
W. R. Young
Royalite Oil Company, Ltd.

Editor's Note—The CHICAGO TRIBUNE once published a readership survey showing that many oil company advertisements were aimed more at competitors than consumers . . . that many motorists didn't understand much of the gasoline and motor oil advertising put out. Upon hearing reports of an unusual lubricating grease campaign in Canada, NLGI asked Mr. W. R. Young to recapitulate his company's program. The following is offered as a service to the industry, and the Institute would like to thank the management of the subject firm for their information. It is a valuable contribution at a time when the industry is campaigning so actively to boost sales in chassis lubrication.

WHAT CAN a company do to achieve motorist attention in its sales area? Take Royalite Oil Company, Limited, headquartering in Calgary, Alberta, Canada and serving the western part of the Dominion—we earned new sales with lubricating grease, and the process hasn't begun to slow down!

In the fall of 1958, the men of Royalite's sales department and our area sales managers became convinced that Royalite, as an independent marketer, could best meet their market competition by offering a compact line of high quality lubricants and backing them with strong training, sales and advertising promotions. Accordingly, a meeting was scheduled with the grease supplier and the entire line of Royalite lubricants was closely examined as to quality, technical soundness and modern application requirements. As a result the line was sharply consolidated, with certain products completely eliminated. Other high quality lubricants were added to provide a compact, yet balanced product inventory to meet the general service requirements of Royalite customers throughout Canada's three western provinces.

Next, the company's advertising agency, Brown, Mitchell & Wright Limited, was consulted to provide recommendations for package design and name revisions that would provide instant product recognition for Royalite motor oils and lubricants. This resulted in the production of a new series of packages and product designations designed to secure immediate dealer, jobber and customer recognition. Once this project was completed and approved, the agency, working under client technical services direction, produced a Royalite products book, giving complete details of the revised product line and full color illustrations of the new containers. This part of the program was considered essential in order that sales staff, agents, distributors and dealers would be fully introduced to the revised product line prior to any consumer promotion or advertising.

Royalite management then embarked on a full scale training program. District sales representatives were fully indoctrinated by area sales managers at a series of local sales meetings. Distributors and agents were then invited to attend a two-day conference in March, 1959 during which one full day was devoted to a complete summary of the product line. The sales manager of the independent grease manufacturer supplying Royalite gave Royalite distributors and agents full sales and technical details on the new lubricants to be marketed by Royalite. Participants were advised that the new product line would be available shortly and that as present product inventories became exhausted, they would be replaced by the new product series.

AGENTS and distributors were introduced to new line in a colorful skit by C. E. Gore, sales manager for the grease manufacturer supplying Royalite.

A by-benefit of the line consolidation was that its relative simplicity allowed easier product indoctrination to be effected on the sales-distributor-agent-dealer organization. This fact was heavily stressed as Royalite management realized the importance of all concerned personnel being fully conversant with the modernized line. Knowledge builds confidence and successful sales effort requires full confidence in the product.

The advertising agency was represented both at sales meetings and the agent-distributor conference, presenting upcoming promotion plans for an intensive

SUB-ZERO grease demonstrations are not unusual in the Royalite marketing area . . . this one at Grande Prairie, in the Peace River area, is taking place in a community on the route to the Alaska highway. Note ad poster tie-in.

fall advertising and sales promotion campaign, designed to introduce the new products.

Believing that too many oil companies were concentrating on "me-too" concept of gasoline ads, Royalite management wanted to present a new concept that would do more than pay lip service to the idea of product advertising. The program required was one that would reach the consumer in an arresting, yet believable manner, which would result in increased sales. Yet it had to be accomplished with a budget which was moderate, by competitive standards.

Planning for the fall advertising campaign moved into high gear and an often overlooked product, from an advertising point of view, was selected to keynote the campaign. With almost every competitive oil company, advertising and promotional efforts centered on motor oils or gasoline. Royalite felt that the fuel and motor oil sales would come if the prospective customer could be drawn in by the prospects of unusual service and protection to be gained from the use of a distinctive Royalite grease.

Accordingly the campaign centered around a new Royalite lubricating grease, designated Regalube 2595, a multi-purpose product that was particularly well suited to serve the market requirements of Western Canada. A fully integrated advertising and sales promotion campaign featuring Regalube 2595 broke in major media in September, 1959.

Just how well it worked will be noted later, but sales gains don't come without careful planning and a quick resume of how a radical concept was engineered is called for here.

Over a year of planning by staff and agency personnel accomplished a number of things, including:

1. New product packages leading to easy recognition by customers.
2. New product manuals, compiled and published, distributed to area managers, sales representatives and agents.
3. New lubricating grease product name "REGALUBE 2595" with consumer appeal worked out in copy and illustration "The Choice of 43 Nations!" Analysis of *customer* benefits: year 'round protection—hot or cold, water resistance (Pacific Coast rain belt), dust and heavy-duty protection (farm and prairie use compared to military applications).
4. Station service qualified and typed and point-of sale material formats designed to be interchangeable.
5. Intensive education throughout the entire company. Channels of communication defined and cleared from marketing management through to area managers, sales representatives and operators, agents, distributors.
6. Extensive sales meetings complete with illus-

trations and all material displayed, campaign laid out in detail for everyone to see.

Owing to the nature of the product selected for the promotion, Royalite anticipated a gradual consumer response. Only it didn't work that way—public acceptance caught on immediately, with the result that sales became double their normal seasonal rate.

More important, that professional skeptic on the drive, the station operator, became convinced. The combination of an advertising-awakened public greeted by an enthusiastic driveway salesman made a combination which couldn't be stopped and suddenly the new Royalite image of a hand holding a grease gun became synonomous with service.

Tied into the traditional service station fall package promotion, Regalube 2595 was promoted with one of the largest seasonal ad budget allocations in the firm's history. Radio, television, newspapers, farm papers and 24 sheet outdoor posters were the media while stations had plenty of A-frame material, window posters, pole signs and inserts—all stressing Regalube 2595 grease by Royalite!

At this point it should be stressed that Regalube is not a Royalite exclusive, which gives the company a competitive edge. Most of us know the product as MIL-G-10924A, the military spec which has been accepted by NATO and "43 nations" as the ads put it. With the temperature extremes experienced in their marketing area, Royalite took a good grease which would stand the 110° of the prairies in the summers, yet cope with the 60° below zero of Yukon winters. Since the company purchases all its lubricating greases and fluid gear lubricants from an independent manufacturer, they merely borrowed the supplier's formula number, added the name Regalube, packaged this proven grease in a new Royalite container, and introduced Regalube 2595. The public bought it.

And how they bought it. Lubricating grease, in terms of grease jobs increased anywhere from 50 per cent to 200 per cent, depending on the area. Actually, significant gains in grease sales were made in the six-month period beginning in June when the product reached agents and dealers who had been well indoctrinated with pertinent product knowledge. Sales were really stimulated through the fall campaign which ended December 1, 1959. (Gains have continued since that time up to the present, with percentages slightly above the first six-month recounting.) Gasoline, oil and TBA sales reflect the grease increase and volume has climbed to a new level.

The story isn't over. Royalite has the winning combination of advertising pegged on lubricating grease, and you never quit a winner. Company officials feel they have attracted a greater than average share of that large segment of the motoring public noted in the many surveys . . . the fellow who is looking for service on that big rolling investment, his automobile. The success of "REGALUBE 2595" in service stations was paralleled by the results in another important market: farm and commercial sales. The sales department has been working with these proven principles of grease promotion on another record-breaking campaign aimed at farm and industry which commenced on April 15, 1960.

This campaign featuring Regalube in cartridges was used as a spring "gate opener" in the Western Canadian farm market. In addition, Regalube cartridges and hand guns are featured in many Royalite service stations where they are being enthusiastically sold to drive-in customers. The company will push their successful lubricating theme and convince the driver that Royalite is the hallmark of motoring satisfaction. ■

FINAL check of campaign material before presentation by Don Lounsbury, sales promotion manager; W. R. Young, manager, sales department; Ken Wright, ad agency vice-president; and Bob Young, agency account executive. Once approval was received, the drive for new customers began, will be carried forward into 1960, as Royalite likes the results.

nlgi NATIONAL LUBRICATING GREASE INSTITUTE

GLOSSARY

Definitions of Terms Relating to the Lubricating Grease Industry

Lubricating Grease—A solid to semi-fluid product of the dispersion of a thickening agent in a liquid lubricant. Other ingredients imparting special properties may be included.

This definition, adopted by the American Society for Testing Materials, accepted by the National Lubricating Grease Institute and quoted from the current edition of the D-2 handbook, is accepted by all competent authorities—but the definition does not mean the same thing to everyone in the industry.

In recognition of this fact, and of the second fact that not all terms used in the lubricating grease industry had commonly accepted meanings, an NLGI Technical Subcommittee began working on a set of definitions of terms commonly used in the lubricating grease industry . . . each of which was to be capable of only a single interpretation. The second objective was to make the definitions usable by marketing as well as technical people. Finally, the subcommittee tried to be selective . . . to determine preferred usage.

Over a period of five years, three sets of definitions have matriculated from the Subcommittee on Manual of Test Methods and Definitions of Terms Peculiar to the Lubricating Grease Industry, through the NLGI Board of Directors, and finally to the entire membership of the Institute. Publication has followed in the journal of the Institute, the NLGI SPOKESMAN, in the September, 1957, November, 1958 and May, 1960 issues. The alphabetical glossary on the following pages is the combined result.

Special appreciation has been accorded to the many men of the Institute who have contributed in the past. The work will continue under the new chairman of the subcommittee, Mr. A. S. Orr of the Gulf Oil Corporation, Pittsburg, who has served many years as vice chairman. To those who have been of such material aid in the past, NLGI gives special thanks. These men include:

W. J. Ewbank, Chairman 1952-60, Cato Oil & Grease
A. S. Orr, Vice Chairman, Gulf Oil
C. J. Boner, Battenfeld Grease & Oil
J. W. Blattenberger, Cities Service Res. & Dev. Co.
L. C. Brunstrum, Standard Oil (Indiana)
M. L. Carter, Southwest Grease & Oil
T. E. DeVilliers, Cities Service Oil
J. J. Dickason, Jesco Lubricants
H. U. Fisher, California-Texas Oil
E. M. Higgins, Master Lubricants
C. E. Hulme, Kendall Refining
T. G. Roehner, Socony Mobil
J. D. Smith, International Lubricant
H. C. Zweifel, Richfield Oil

This is the first compilation of the glossary, and it is the intent of NLGI to issue modifications as they are approved by the industry. It is offered as a means of improved communication within the industry, as well as with the customers of the industry.

DEFINITIONS

ADDITIVE—any material added to a lubricating grease or lubricating oil to improve its suitability for service. It may improve a property already possessed by the lubricant or give it properties not naturally possessed. (Additives are the "other ingredients imparting special properties" referred to in the definition of lubricating grease. Typical examples are anti-oxidants and "EP" or anti-weld additives.)

AGE HARDENING—increase in consistency (hardening) of a lubricating grease with storage time.

APPARENT VISCOSITY—the ratio of shear stress to rate of shear of a non-Newtonian fluid, calculated from Poiseuille's equation and measured in poises. (Changes with changing rates of shear and temperature, and must therefore be reported as the value at a given shear rate and temperature.)

BLEEDING—the separation of liquid lubricant from a lubricating grease for any cause. (While excessive bleeding is harmful, a small amount of free oil can aid in lubrication.)

CAVITATION—in a lubricating grease dispensing system, failure for any reason of the material to flow to the suction of the system pump. (See also FEEDABILITY.)

CHANNELING—1. a term used in connection with lubricating greases to describe the (usually desirable) tendency to form a channel by working down of lubricating grease in a bearing, leaving shoulders of unworked grease which serve as seal and reservoir.

2. a term used in connection with liquid lubricants and flow type lubricating greases to describe the tendency at low temperatures, for these materials to form a plastic structure sufficiently strong to resist flow under gravitational forces only. (Similar to, but not identical with the pour point of liquid lubricants, it is measured by empirical tests such as Federal Method 3456-T.)

COLD SETTS—see SETT GREASE.

COMPLEX SOAP—a soap wherein the soap crystal or fiber is formed by co-crystallization of two compounds:

1. the normal soap (such as metallic stearate or oleate).

2. the complexing agent. (Examples of complexing agents are the metallic salts of short chain organic acids such as acetic or lactic, or the inorganic salts such as the carbonate or chlorides. Still another complexing agent is water, in which case the soap may also be referred to as a HYDRATED SOAP.)

CONSISTENCY (HARDNESS)—the degree to which a plastic material such as lubricating grease resists deformation under the application of force. (It is therefore a characteristic of plasticity, as viscosity is a characteristic of fluidity. Consistency is usually indicated by either apparent viscosity or ASTM penetration.)

CORROSION—the gradual destruction and/or pitting of a metal surface due to chemical attack. This chemical attack may be, but is not necessarily, due to the formation of acidic materials in the lubricant. See also FRETTING.

DISPENSABILITY—the property of a grease which governs the ease with which it may be transformed from its container to its point of application. Most used in discussion of dispensing in grease systems, where it includes both the properties of pumpability and feedability.

DROPPING POINT—the temperature at which a drop of material falls from the orifice of the test apparatus under the conditions of ASTM test D566-42. (This test should be considered as having very limited bearing upon service performance. It is not the melting point of the grease, this being a term of little or no significance, when applied to plastic materials such as lubricating grease. These materials are characterized by a *melting* range during which the material becomes steadily softer. Only through the establishment of an arbitrary and fully controlled test procedure such as the ASTM Dropping Point, can any single temperature be established as a characteristic of the material. A similar test, differing only in details, the IP "Drop Point" usually gives a lower value.)

FALSE BRINELLING—See FRETTING.

FEEDABILITY—the ability of a lubricating grease to flow to the suction of a dispensing pump at a rate at least equal to pump delivery capacity. (Some lubricating greases do not feed satisfactorily and cause cavitation at the inlet to a dispensing pump. In such cases, feedability can often be made satisfactory by the use of follower plates.)

FIBER—in lubricating grease, the form in which soap thickeners occur, the soaps crystallizing in threads which are of the order of 20 or more times as long as they are thick. (Most soap fibers are microscopic in size, so that the grease appears smooth to the eye. The greases having FIBROUS appearance are those where the fiber bundles are large enough to be seen by the naked eye. The most common fibrous lubricating grease is sodium base, although not all sodium base greases are fibrous.) See also APPEARANCE AND TEXTURE.

FIBRIL—an extremely small fiber, usually barely visible even at maximum magnification of the electron microscope. Fibrils may collect in bundles to form the larger fibers.

FOLLOWER PLATE—a plate fitted to the top surface of lubricating grease in a container and so designed that as lubricating grease is dispensed, atmospheric pressure assists gravitational forces in delivering grease to the inlet of the dispensing system.

FRETTING—the removal of very finely divided particles from bearing surfaces due to inherent adhesive forces which are assisted by vibrating motion. The finely divided wear particles are then usually oxidized to a corrosion product which has led it to be called FRETTING CORROSION, although corrosion does not enter into the basic mechanism. It has also, in the past, been called FALSE BRINELLING and FRICTION OXIDATION when it occurred in rolling contact bearings.

FRETTING CORROSION—See FRETTING.

FRICTION OXIDATION—See FRETTING.

HOMOGENIZATION—the process of subjecting a lubricating grease to intimate mixing and intensive shearing action, the end result of which is to obtain a more uniform and higher degree of dispersion.

INCOMPATIBILITY—two lubricating greases show incompatibility when a mixture of the products shows physical properties or service performance which are markedly inferior to those of either of the greases before mixing. Performance or properties inferior to one of the products and superior to the other may be due to simple mixing and would not be considered as evidence of incompatibility.

INORGANIC THICKENER—See NON-SOAP THICKENER.

LUBRICATING GREASE STRUCTURE—the physical arrangement of the component particles of a lubricating grease thickener, additive and liquid lubricant. It is the nature and stability of this arrangement which determine the appearance, texture and physical properties of lubricating grease.

MECHANICAL STABILITY—See SHEAR STABILITY.

NEWTONIAN BEHAVIOR—the property of simple liquids by which the rate of shear is proportional to the shearing stress. This constant proportion is the viscosity of the liquid.

NLGI NUMBER—a numerical scale for classifying the consistency range of lubricating greases, and based on the ASTM penetration number. NLGI grades are in order of increasing consistency (hardness) as follows:

NLGI NUMBER	ASTM Worked Penetration
0	355-385
1	310-340
2	265-295
3	220-250
4	175-205
5	130-160
6	85-115

(Greases both softer and harder than this consistency range are well known in the industry. Such greases do not bear an NLGI number.)

NON-NEWTONIAN BEHAVIOR—the property possessed by some fluids and many plastic solids including lubricating grease, of having a variable relationship between shear stress and rate of shear. (Non-Newtonian materials, therefore, *do not possess a viscosity* as defined by Newton, but rather an apparent viscosity, the quantitative value of which may vary widely with varying shear rate. Conventional types of viscometers with uncontrolled shear rates will not satisfactorily measure non-Newtonian materials.)

NON-SOAP THICKENER—any of several specially treated or synthetic materials, excepting the metallic soaps of long chain fatty acids, which can be either thermally or mechanically dispersed in liquid lubricants to form lubricating grease. Also called SYNTHETIC THICKENER. Certain types are called INORGANIC THICKENERS.

PENETRATION—an arbitrary measure of consistency (hardness), based on ASTM Method D217-52T (and similar methods standardized by other organizations). (All penetration measurements are in an inverse scale of consistency—that is, the softer the consistency, the higher the penetration number.)

The ASTM definitions are given as follows:

PENETRATION of lubricating grease is the depth, in tenths of a millimeter, that a standard cone penetrates the sample in a standard cup under prescribed conditions of weight, time and temperature. The penetration depends on whether or not the consistency has been altered by handling or agitation.

WORKED PENETRATION is the penetration of a sample of lubricating grease immediately after it has been brought to 77 F and then subjected to 60 strokes in a standard grease worker.

UNWORKED PENETRATION is the penetration at 77 F of a sample of lubricating grease which has received only the minimum handling in transfer from sample can to test apparatus and which has not been subjected to the action of a grease worker.

BLOCK PENETRATION is the penetration at 77 F of a sample of lubricating grease that is sufficiently hard to hold its shape.

PLASTICITY—that property of apparently solid material which enables it to be permanently deformed under the application of force, without rupture. (Plastic flow differs from fluid flow in that the shearing stress must exceed a yield point before any flow occurs.)

PUMPABILITY—the ability of a lubricating grease to flow under pressure through the line, nozzle and fitting of a grease dispensing system. It is best indicated by the apparent viscosity at moderate rate of shear. (See NLGI Tentative Method for Matching Lubricating Grease Flow Properties with Lubricating Grease Dispensing Pump Delivery Behavior at Low Temperatures.)

RHEOPECTIC GREASE—a lubricating grease which has the property of increasing in consistency, (hardening appreciably) upon being subjected to shear.

SETT GREASE—a lubricating grease made by mixing a mineral oil slurry of an alkali and a mineral oil solution of a fatty acid, saponification usually being completed after the mixture is poured into the shipping container. As the temperature of the mixture is generally less than 140 F, these products are sometimes known as COLD SETTS. Axle grease is usually a SETT GREASE.

SHEARING—slipping or sliding of one part of a substance relative to an adjacent part. In a solid, such action involves cutting or breaking of the crystal structure, but in a fluid or plastic, shearing does not necessarily destroy the continuous nature of the substance.

SPECTACULAR!

ONE GREASE
ONE GRADE

YEAR 'ROUND—ALL APPLICATIONS

Code 12132

SHEAR STABLE

NO MELTING POINT

PRESSURE PROOF

OXIDATION RESISTANT

Truly Multi-Purpose

see following page

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"Leaders for Lubrication Products"

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19530 So. Alameda, Compton, California

LITHOGRAPHED IN U. S. A.

Sensational News in Lubrication Circles!

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ONE GRADE

YEAR AROUND FOR ALL APPLICATIONS

Code 12132

NON CORROSIVE — NON ACTIVE . . . has tremendous E.P. characteristics, yet contains NO chemical E.P. agents.

WORK STABLE . . . for long lubrication life in "hard-to-get-to" applications. Breaks only 14 points on 100,000 strokes with Navy small hole worker! Maintains consistency over wide temperature range. Penetration is essentially the same at 30°F., as it is at 250°F.

NO MELTING POINT . . . the oil constituent will actually char and burn before soap structure will melt — yet this New Concept Grease has none of the undesirable characteristics of inorganic, non-melt greases!

OXIDATION-RESISTANT . . . less than 10# drop in 500 hours. (Typically 3# drop in 100 hours!)

Actual Timken Block Photos show "Pressure Proof" Natural Film Strength of Code 12132.

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CODE 12132 (NLGI 1# grade) has equal low temperature pumpability with O grade conventional industrial lubricants. Allows year around usage—yet gives far greater protection through more effective sealing, water resistance, E.P. strength, and heavier consistency.

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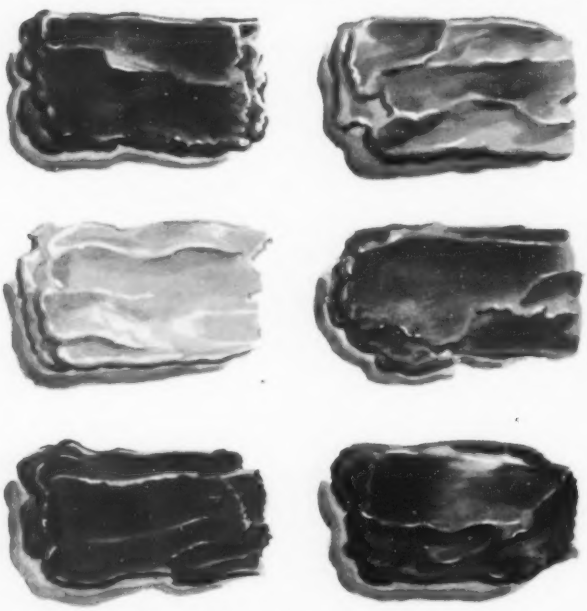

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HEAT STABILITY

Condition: Sample in oven for three hours @ 300°F., cooled to 77°F. and penetrate undisturbed surface with Micro-Penetrometer.

Before	120 points
After	82 points
Points change	38 points (hardening change)

BE FIRST TO CRACK THE INDUSTRIAL MARKET WITH THIS SPECTACULAR PRODUCT!

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LITHOGRAPHED IN U. S. A.

SHEAR RATE—the rate of slip within a substance engaging in flow. The average or *mean* shear rate in a pipe or tube is the average velocity divided by the radius of the tube. It, therefore, has the dimensions of the reciprocal of time and is usually expressed in the unit of reciprocal seconds (sec^{-1}). The mean shear rate is reported in the determination of apparent viscosity in ASTM Method D1092-55.

SHEAR STABILITY—the ability of a lubricating grease to resist changes in consistency (hardness) during mechanical working. Working may be in any of several types of laboratory machines or may be in actual service. This may also be called MECHANICAL STABILITY.

SHEAR STRESS—the force required to cause shearing in a substance. In fluids, the relation of the shear stress to the shear rate is the viscosity of the substance.

SOLID LUBRICANT—any class of lubricants wherein the reduction of friction and wear during sliding is caused by making the shearing take place within the crystal structure of a material with low shear strength in one particular plane. Examples include graphite, molybdenum disulfide and certain soaps. Lubricating grease is *not* a solid lubricant, but may contain solid lubricants as additives.

SYNERESIS—loss of liquid lubricant from a lubricating grease due to shrinkage or rearrangement of the structure. The shrinkage may be due to either physical or chemical changes in the thickener. Syneresis is a form of BLEEDING.

SYNTHETIC THICKENER—See NON-SOAP THICKENER.

THICKENING AGENT—the solid particles which are relatively uniformly dispersed to form the structure of lubricating grease in which the liquid is held by surface tension and other physical forces. (The solid particles may be fibers, as is the case with various metallic soaps, or plates of spheres, as is the case with some of the non-soap thickeners. The only general requirements are that the particles should be extremely small and that they be capable of uniform dispersion in the liquid lubricants.)

THIXOTROPY—in lubricating grease, that property which is manifested by a decrease in cosistency, or softening, as a result of shearing, followed by an increase in consistency, or hardening, beginning after shearing is stopped. (Thixotropic age hardening is a relatively prolonged process proportional to aging time, and is seldom if ever, complete, whereas the apparent viscosity increase which occurs in non-Newtonian systems with decreasing shear rate is instantaneous and fully reversible. Lubricating grease is *both* thixotropic and non-Newtonian.)

WORKING—subjecting lubricating grease to any form of agitation or shearing action.

YIELD (OF LUBRICATING GREASE)—the amount of grease of a given consistency which may be made with a definite amount of thickening agent. As the yield increases, % thickener decreases.

YIELD POINT (OR YIELD VALUE)—the minimum force required to produce flow of a plastic material. It is estimated by the intercept on the shear stress axis of the shear stress-shear rate curve, by extrapolation of the straight portion of the curve. ■

Additional copies of the NLGI GLOSSARY . . . Definitions of Terms Relating to the Lubricating Grease Industry . . . may be purchased from the NLGI national office, 4638 J. C. Nichols Parkway, Kansas City 12, Missouri, U.S.A. NLGI members may purchase them for 15¢ per copy . . . non-members for 25¢.

Printed in U. S. A.

Literature and Patent Abstracts

Composition

Twister Ring Lubricants

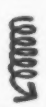
Twister ring lubricants, having outstanding extreme pressure and wear-resistant properties, consist of petrolatum thickened to a grease consistency by a mixture of hydrous metal salts. A variety of petrolatums can be used, but the most desirable are those having melting points of 110 to 135°F and penetrations of 200 to 275. The preferred thickener consists of calcium salts formed from a mixture of acetic acid and intermediate molecular weight monocarboxylic acids.

Thus, Morway (U. S. Patent 2,922,762, assigned to Esso Research & Engineering Co.) describes the production of such a lubricant in which 81.5 per cent of cream petrolatum, having a melting point of 115 to 125°F and a penetration of 210°F, was melted at 120 to 125°F. Six and one-half per cent of hydrated lime was thoroughly mixed with this petrolatum and then a mixture of 8 per cent glacial acetic acid and 4 per cent of commercial caprylic acid was added. The temperature of the mixture increased to about 175°F after the addition of the acids and stirring was continued until the heat subsided. After cooling, the mixture was passed through a Morehouse mill.

The product, which was smooth, had a worked penetration of 198 at 77°F and a dropping point of 200+ F. In a Shell 4-Ball Wear Test, conducted at 1800 rpm, 10 kg. load and 75°C for one hour, the spot diameter on the ball was 0.28 mm.

Oxidation-Resistant Lubricating Greases Containing Inorganic Alkali Metal Compounds of High Alkalinity

The oxidation resistance of certain lubricating greases is improved by including in the composition 0.5 to 10 weight per cent of oil-insoluble poly-alkali metal salts of inorganic polybasic oxygen acids of silicone or phosphorus. As desccribed by Sproule, Norton and Pattenden in U. S. Patent 2,921,899 (assigned to Esso Research & Engineering Co.), it is possible to make a concentrate of a grease-like nature in which the salt is present in a proportion of 15 to 80 per cent and a soap is present in a proportion of 1 to 25 per cent of the whole. In lubricating greases best results are ob-

If it rolls on an axle or turns in a bearing or rides on a shaft if it slides in a groove or moves on a pivot if it bores  or cuts or transmits pressure
one of Sinclair's 500 specialized lubricants is designed to make it work better. For answers to your lubrication problems, write today to

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Better Greases Through BAROID RESEARCH

BARAGEL* gives more efficient gel structure —in a greater variety of oils

BARAGEL, a non-soap grease-gelling agent, gives high gel structure in a great variety of oils. This versatility is the result of constant research in Baroid Chemicals' Houston Laboratories. BARAGEL greases are compounded and subjected to the most rigid testing.

One of these tests measures oxygen absorption to determine the resistance of BARAGEL greases to oxidation. BARAGEL greases are easily inhibited with a variety of antioxidants to provide excellent oxidation resistance. Such greases show minimum oxygen absorption under the most rigorous operating conditions.

BARAGEL is a reaction product of mixed organic ammonium halides and refined sodium montmorillonite. BARAGEL is a member of the BENTONE* family of products which has been outstandingly successful in lubricating greases, paints, plastics, inks and other fields.

*Trademark of National Lead Company for an organic ammonium montmorillonite

6063

BAROID

BAROID CHEMICALS, INC.

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HOUSTON 2, TEXAS

tained if the salt and the soap contain the same base. However, such a concentrate can be added to lubricating greases thickened with either soaps or inorganic compounds.

A sodium-soap lubricating grease was made as follows: twenty grams of 12-hydroxystearic acid and eight grams of candelilla wax were dissolved at 180 to 200°F in 64 grams of oil having a viscosity of 110 SUS at 210°F and a V.I. of 90. Eight grams of sodium hydroxide dissolved in twenty grams of water were then added to neutralize the fatty acids. This was followed by 240 grams of trisodium phosphate dissolved in an equal weight of water. After partially dehydrating this mixture at 300°F, 75 grams of oil and 1.4 grams of phenyl alpha naphthylamine were added. Dehydration was then completed at 300°F giving a product having a dropping point of 450+ F and a micropenetration of 38 mm/10. After operating for 3200 hours in a bearing at 300°F, the micropenetration was 25, indicating that only limited oxidation or evaporation had taken place.

A grease - inhibitor concentrate was made by adding a solution of 20 grams of trisodium phosphate to a mixture of 57 grams of calcium stearate in 30 grams of mineral oil and heating to 300°F. A hard mass was obtained which was said to be useful as an antioxidant.

Lubricating Greases Containing Metal Salts of the Reaction Product of Alkylphenol, Fatty Acid and Aldehyde

Hotten in U. S. Patent 2,921,904 (assigned to California Research Corp.) describes lubricating greases consisting of oils thickened with metal soaps of alkylphenol - fatty acid - formaldehyde condensation products. Such lubricants, made from various metal bases, are high melting point and oxidation and water resistant.

For example, a mixture of 108 grams of p-cresol and 284 grams of stearic acid was heated and stirred in a glass flask. At 212°F, 60 grams of paraformaldehyde were added and the mixture was heated to 212 to 257°F for two hours, followed by heating for an additional two hours at 320 to 355°F. When the condensation reaction was complete, as indicated by the water of reaction, the admixture was cooled to room temperature. Thirty grams of the resulting product were added to 179 grams of a California solvent refined paraffin base oil having a viscosity of 450 SUS at 100°F and the mixture was heated to 350°F, followed by cooling to 200°F, at which temperature three grams of sodium hydroxide in about 10 ml. of water were added. The resulting mixture was heated with stirring to 400°F, followed by pan cooling, and subsequent milling through an 80-mesh screen.

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"To-the-minute" delivery of dependable J&L drums and pails for petroleum products is possible because of the strategic location of these *nine completely equipped* J&L container plants.

Proof? Seven of these nine Jones & Laughlin plants are located in the four major consumption areas for lubricating and grease products.

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FA 1-1212

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BY TRUCK—When truck delivery is most convenient, "to-the-minute" service by truck line is assured.

BY RAIL—J&L plants are located near major rail centers for fast, dependable delivery to your operations.

The resulting lubricating grease had an unworked penetration of 189 at 77°F, a worked penetration of 248 and a dropping point of 342°F.

Mixed Salt Thickened Lubricants

According to Morway (U. S. Patent 2,923,682, assigned to Esso Research & Engineering Co.), a mixture of alkaline earth salts of a dialyyl dithiophosphoric acid, acetic acid and intermediate molecular weight monocarboxylic acids are used to form lubricating greases or fluid lubricants having high load-carrying ability, reduced wear characteristics and a lower degree of thixotropy than previous salt-thickened products.

The salt mixtures are prepared by co-neutralization of the acid mixtures in situ in lubricating oil at a temperature of 150 to 350°F. Suggested mixtures of the acids are one part by weight of dialkyl dithiophosphoric acid, one to two parts by weight of intermediate molecular weight fatty acids and five to one part by weight of acetic acid. Hydrated lime is the preferred base used to form the salts.

For example, a slurry was made of 7.8 per cent of hydrated lime in 77.8 per cent of lubricating oil having a viscosity of 45.3 SUS at 210°F and a V.I. of 110. A blend of 10 per cent glacial acetic acid, 2.4 per cent of acids containing 20 per cent lauric, 24 per cent caprylic and 66 per cent capric, and 2 per cent of dihexyl dithiophosphoric acid, was added to the lime-oil slurry slowly with agitation over a period of one hour. No external heat was used, but the temperature rose to 160°F during the addition. After cooling to 100 to 120°F while agitating, the mixture was homogenized to give a lubricating grease having a dropping point above 500°F and a worked penetration of 320. This stood a full load on an Almen tester and on a 4-Ball Wear Test gave a scar spot diameter of 0.23 mm. after one hour with a 10 kg. load.

Processing

Experimental Preparation of Soap-Containing Grease in a Continuous-Operating Installation

An article by Nikolayeva, Oparina and Tropkina (Khimiya i tekhnologiya topliv i masel, 1960, No. 1, pp 19-23 [USSR]) describes a continuous - operating lubricating grease process having a capacity of 4 kg. per hour. A slurry of 88.7 per cent oil, 11 per cent lithium stearate and 0.3 per cent diphenyl amine was passed through a cylindrical heat exchanger equipped with rotating scrapers and then through a cooler equipped with a spiral-band scraper and finally into a paddle mixer. Optimum conditions of operation were an exit temperature from the heater of 170 to 180°C and from the cooler 16 to 24°C. The product met the specifications of GOST 6267-56 (USSR).

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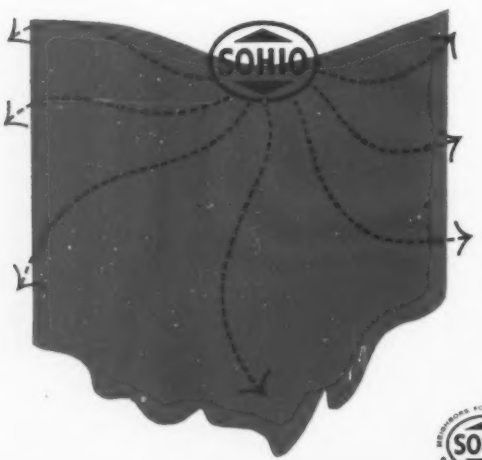

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Method for Degasifying Bentone-Bodied Lubricants

Stratton (U. S. Patent 2,921,028, assigned to Phillips Petroleum Co.) claims that clear, "bright" lubricating greases can be formed from "Bentone" clays if the thickener is deaerated prior to being colloidally dispersed in the oil.

Removal of the entrapped air can take place, either in a dry state or after the Bentone has been slurried in oil. Vacuum is the preferred method for deaering. Due to the fact that such a treated product does not "puff up" when heated to mild temperatures, it is said to be superior to a lubricant not so treated.

Test Methods

Development of a Thermal-Oxidation Stability Test for Gear Lubricants by Nelson T. Meckel, Ordnance Fuels And Lubricants Laboratory, Southwest Research Institute.

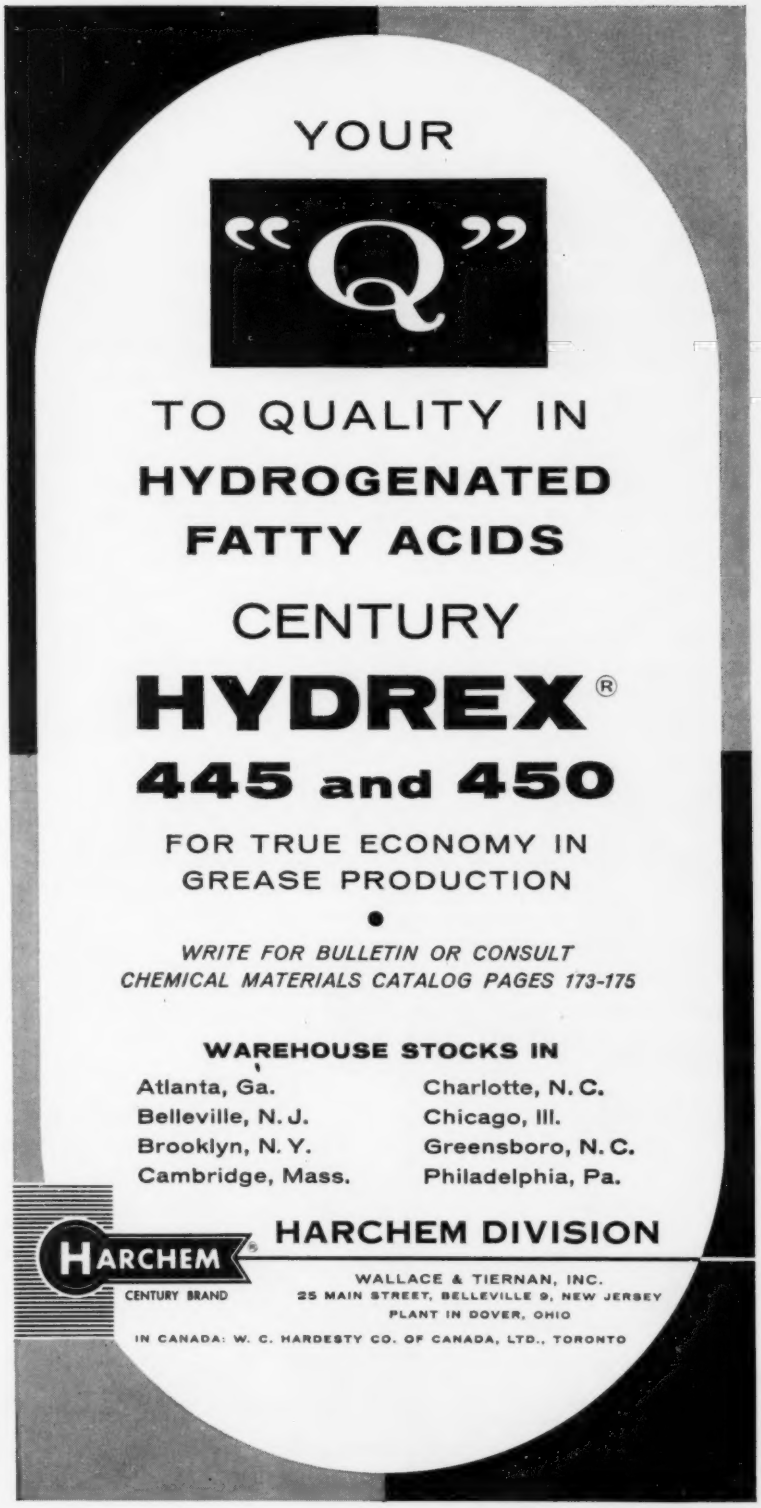
PB 138780, obtainable from Library of Congress on microfilm $6.30; as a photostat $19.80.

An apparatus and procedure to determine thermal-oxidation stability of gear lubricants was developed. The objective of this work was to devise a thermal - oxidation test technique which would correlate with military field test results. A refined laboratory version was designed and a final test procedure was developed. The apparatus, procedure and test results are presented in this report.

Characteristics

Viscous-Mobile Properties of Mixtures Of Lubricating Greases

G. V. Vinogradov and V. V. Sinitsyn (Khimiya i tekhnologiya topliv i masel, 1960, No. 1, pp 27-32 [USSR]) made mixtures of four different lubricating greases containing the following thickeners: (a) 12 per cent calcium soap of cottonseed oil; (b) 16 per cent of calcium soap of synthetic acids; (c) 20 per cent of sodium soap of castor oil; and (d) 10 per cent of lithium stearate. Mixtures were then made of a/b, a/c, a/d and c/d in



25/75, 50/50 and 75/25 ratios and the plasticity, syneresis and viscosity characteristics were determined.

Results with the a/b mixtures changed in a linear manner with the proportion of thickener. In the case of a/c mixtures, the results were not additive as the proportion of thickener increased but depended upon the fluid medium. It was concluded that the addition of a small proportion of sodium soap grease to the lithium soap grease increased the stress limit of the latter.

Application

Jet and Space Age Lubrication by E. B. Palmer, *Scientific Lubrication* 12, No. 2, February 1960, pp. 12, 14-17

The lubricants in question may be subjected to wide temperature extremes, various meteorological conditions and nuclear radiation. Any or all of these conditions may influence the performance, life and function of the lubricants.

A diagram indicates that lubricating greases are currently available which function satisfactorily over ranges of either -100°F to +250°F or -65°F to +400°F. Also a variation of the latter type has extended the upper range to +450°F and for short periods to 500°F. The latter products are currently being used in wheel bearing lubrication on supersonic aircraft. Further, silicones are finding application under some conditions over a range of -87°F to 500°F. Likewise, severely hydrogenated mineral oils have a potential use temperature in excess of 500°F.

It has been found that the dyestuff indantherene is extremely resistant to damage by radiation and this compound should have application as a thickener for lubricating greases if an equally good fluid could be found. Further, the testing methods to date for radiation damage to lubricating fluids do not duplicate anticipated operating conditions.

The entire article indicates the national importance of the problems connected with jet and space vehicles and therefore shows why a great deal of study is being given to the subject.

Progress in Roller Bearing Lubrication, O. J. Horger, *Lubrication Engineering*, February 1960, pp. 69-75. Discussion by Wayne Lasky, pp. 75-76

Results of laboratory and field service tests indicate the possibility of operating freight car journal roller bearings over a four-year lubrication period without adding lubricating grease. Since inactive freight cars may present a bearing corrosion problem, CRC L-41 tests were made using eight AAR approved lubricating greases. Three of these products, two lithium base and one calcium-lithium, showed no rusting, three products gave incipient rusting, and two severe rusting.

Observation of the fiber structure of original and used lubricants seems to permit correlation with satisfactory operation.

Plate, Window and Safety Glass Manufacture
***Lubrication* (Texaco Inc.) February 1960**

Since most of the machinery used in this industry is of very heavy duty type, lubricants used require additives. A table lists the types of lubricating greases and oils suggested with the additives used in the same.

Market Potentials for Fats and Oils in Synthetic Lubricants and Lubricant Additives by Frederick J. Poats and Royce G. Freese, December 1959, 29 pages. Published by Agriculture Marketing Service, U. S. Dept. of Agriculture, Washington 25, D. C.

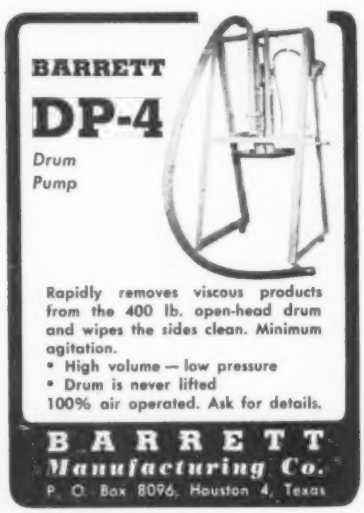
This publication is devoted primarily to the past and potential use of diesters as lubricating fluids. Such information is summarized in Table 1, a portion of which is given below, showing the use in gear compounds and lubricating greases in military purchases.

The selling price of suggested diesters is given as 40 to 60 cents per pound and consequently only their use over a wider temperature range than is possible with a single mineral oil justifies their use.

TABLE 1

Military Purchases of Specialty Lubricants and Greases (in thousand pounds)

Specification				*Estimated*	
Mil. No.	*Use*	1956-57	1957-58	1960-61	1964-65
G-3278	Low and high temp. grease, airframe and instrument	453.80	212.60	250	250
G-7118	Gear grease-EP for aircraft	28.60	31.60	50	75
G-7421	Extreme low temp. grease, aircraft	15.00	5.00	10	10
G-15,793	Instrument grease (Navy)	8.60	21.60	0	0
G-25,013	Extreme high temp. grease for aircraft	8.30	0	20	25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Industry News

ADM To Build Chemical Center at Peoria, Ill.

Archer-Daniels-Midland Co. has announced that it will build a multi-million dollar chemical center near Peoria, Ill. John H. Daniels, president of the world-wide concern, said the new installation will mark a significant expansion by ADM in the chemical field.

ADM has purchased from the Toledo, Peoria & Western Railroad a 200-acre site six miles south of Peoria on the Illinois river.

Ground will be broken for the new chemical center in late summer or early fall, according to Daniels, with plant operations scheduled to begin in the spring of 1962. Cost of the plant was not disclosed, but Daniels said it will be several million dollars.

The ADM center will be a grouping of several chemical processing facilities. When in full production, it will employ about 200 workers.

Girdler Construction Co., Louisville, Ky., is in charge of engineering for the new plant.

Device Prevents Valve Jams on Votator Fillers

Development of a "magnetic monitor" that provides positive control of valve action in high-speed container-filling operations has been announced by Girdler Process Equipment Div., Chemetron Corp., Louisville.

The company reports the new device on its Votator rotary piston fillers will prevent jammed valves and eliminate resultant down time, repair costs and replacement of parts.

The Votator units, used by lubricating and related industries for continuous, automatic filling of liquid and viscous products, come in sizes up to 36 stations with capacities as high as 1200 containers per minute.

Girdler's positive control device is described as a battery of magnets, positioned over the valves on the

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rotary piston filler. With a container in the filling cycle, the action of the continuous magnetic field assures that the proper valve is opened fully and held open until the piston's filling stroke is completed. Smooth, positive control is retained during the entire valving cycle without the threat of sticking, dropping or jamming at all recommended operating speeds, the announcement said.

Elco Report Gives Test Data on Grease Additives

Lube/Report No. 101, "Laboratory Evaluation of SCL and Other Grease Additives," is the title of a new technical bulletin published by the Elco Lubricant Corp.

This twelve-page report presents the results of laboratory tests conducted to evaluate SCL concentrate as a grease additive. Data shows a comparison of SCL, sulfur saponifiable-lead naphthenate and MIL-L-002105A additives. All three additives were tested in seven major types of greases in 6, 8 and 10 per cent concentrations. The blended greases were subjected to the requisite ASTM tests for greases.

All data is reported in complete detail and photographs showing moisture corrosion test comparisons are included.

This report will be of interest to all those responsible for the formulation, manufacture or use of greases.

Copies of Lube/Report No. 101 are available from the Elco Lubricant Corp., Jennings Rd. & Denison Ave., Cleveland 9, Ohio.

Report on Molybdenum Disulfide as Additive to Wire Drawing Lubricants

Bemol, Inc., Boston manufacturer of molybdenum fortified lubricants, announces a progress report on the use of molybdenum disulfide as an additive to wire drawing lubricants.

Technological advances in wire drawing by the use of this lubricant include: 1) elimination of pickling and lime coating, 2) elimination of descaling steps, 3) development of longer lasting wire rope, and 4) successful drawing of rare metals.

A number of wire production efficiencies were also given in the report, which may be obtained by writing the firm at 131 State St., Boston 9, and asking for the report.

New Bel-Ray Lubricant Proves Successful

A new lubricant called "Anti-Seize" introduced to industry by the Bel-Ray company, Collingwood Park, N. J. only months ago has lived up to the promise of its name in applications under extreme pressures and is presently becoming one of the best sellers in Bel-Ray's widely diversified line of specially compounded lubricants.

The function of Anti-Seize, apparent from its name, is to overcome the seizing and galling that takes place in conditions of extreme pressure where the ordinary lubricant fails. But Anti-Seize goes further than that. By reason of its compounding, it also performs with merit beyond its lubrication job and prevents corrosion of parts exposed to most acids and alkalis, water and steam.

This capacity of Anti-Seize to protect metal from wear is demonstrated by several extraordinary tests recommended to prospective customers by its makers. In one of these, the suggestion is to hold a piece of metal with a spot of Molylube Anti-Seize on it over a flame. A tenacious lubricant, Anti-Seize will not melt but sticks to the metal after its cooking.

Another suggestion is to test the metal with its spot of Anti-Seize in boiling water and in nitric acid to show how the lubricant will be unaffected and how it will save the metal it covers. The last suggestion is to ignite some Molylube Anti-Seize, burn it to an ash then note (by rubbing it through the fingers) that there is strong lubricity left in the ash.

Solid Lubricant Stays Put On Heavily-Loaded Turbine Pedestal Gibs

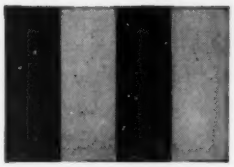
Effective lubrication of very heavily-loaded bearing surfaces is a common industrial problem. For instance, pedestal gibs which support turbo-generating units are difficult to lubricate because the heavy, vibrating load tends to squeeze and wipe away conventional oils and greases from between the bearing surfaces.

Maintenance personnel at New York's Consolidated Edison company of New York have solved this problem in some of their units by regular lubrication of turbine pedestal gibs with Molykote G, a grease-type solid lubricant especially designed by the Alpha-Molykote Corp., Stamford, Conn., for extreme pressure and temperature service. Containing a high percentage of purified molybdenum dissulfide and

other carefully balanced ingredients in a lithium soap base, the material has an easy-to-apply grease consistency. The utility's maintenance personnel apply the lubricant weekly through the turbines' standard pedestal grease fittings.

Although neither bearing pressures nor operating temperatures are especially high — averaging about 150 psi and going up to 250 F — the over-all load is great. A typical gib has a machine bearing surface 3 inches wide and from 3 to 6 feet long. Four of them support the entire weight of a turbine, which may run as high as 65 tons. This loading, combined with the normal vibration of the turbine shell during operation, squeezes and wipes conventional lubricants away.

Lubrication is essential because, as the operating temperature of the turbine varies with fluctuations in load, its shell expands and contracts. Its pedestal gibs must therefore slide on the stationary bed. If the machined bearing surfaces are not free of excessive friction, galling, seizing or metal pick-up might occur, impeding the expansion and contraction of the shell. Any impediment to expansion and contraction causes distortion of the shell and misalignment of the turbine resulting in output fluctuations, if not downright damage. The Molykote G actually plates these surfaces with solid lubricant and maintains this film regardless of the constant action that wipes away ordinary lubricants.



People in the Industry

Foote Names Raynor as General Sales Manager

William M. Raynor has been named general sales manager of Foote Mineral company, according to John S. Gates, vice-president of marketing. Raynor has been with Foote since 1942 and has held positions in both marketing and purchasing for the company. Since 1956, he has been director of purchasing. He succeeds Boyd E. Cass in his new position.

Raynor is a graduate of the University of Pennsylvania and received his degree in electrical engineering in 1931. He is a member of the American Institute of Mining, Metallurgical and Petroleum Engineers and the Electrochemical Society.

Du Pont Names E. H. Simpson

E. Hearn Simpson has been appointed western regional manager for Du Pont's petroleum chemicals division. He succeeds Robert F. Harwick who died in May.

Mr. Simpson started with Du Pont in 1930 and from 1943 until 1946 he was a supply officer in the U. S. Navy. He returned to Du Pont in 1946 as sales manager of the alcohol and camphor section, petroleum chemicals division, and a year later was named assistant sales manager of petroleum additives.

In 1950 he was appointed sales manager in charge of industrial sales for the Petroleum Chemicals Division and the following year was named acting manager of the Eastern Division with headquarters in New York City. In 1952, Mr. Simpson returned to Wilmington as sales manager of the Petroleum Chemicals Division, a post which has now been discontinued.

Emery Promotes Roberts

Promotion of Robert J. Roberts, Ridgewood, N. J., to district manager of the fatty acid sales department of Emery Industries, Inc., has been announced by G. W. Boyd, fatty acid sales manager.

Mr. Roberts will provide field direction for sale of the department's products in the area covered by the New York and Boston offices. This includes New England, Eastern New York State and New Jersey.

Products handled include Emersol stearic and oleic acids; Hyfac hy-

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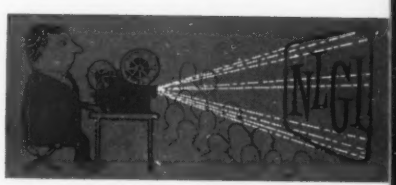

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Kansas City 12, Missouri

drogenated fatty acids, glycerides, and castor derivatives; Emtall tall oil products; and Emery vegetable and tallow fatty acids.

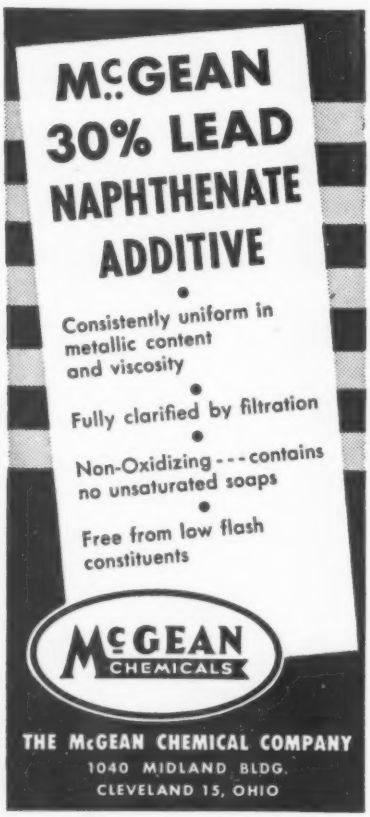
Mr. Roberts first joined Emery in 1939, serving for three years as a control and development chemist. After four years in the Marine Corps and receiving his chemistry degree from the University of Cincinnati, he returned to the company in 1948 to join its chemical sales staff.

Sun Appoints Anderson Director of Production

Appointment of Richard R. Anderson as director of production for Sun Oil company has been announced by Jno. G. Pew, senior vice-president.

Formerly an administrative assistant to the production vice-president, Mr. Anderson succeeds Kingsley V. Schroeder, who recently was named vice-president in charge of domestic and Canadian production activities.

Mr. Anderson was born in Ithaca, N. Y., on December 29, 1916. He graduated from Cornell University in 1938 with a bachelor of arts degree in economics, and subsequently completed a course in petroleum engineering. He joined Sun in 1938.



Rheem Container Division Appoints G. G. Tucker

G. Gwyn Tucker is the newly-appointed national accounts sales manager of the container division of Rheem Manufacturing company, filling the vacancy left by the recent death of F. J. Blume.

Mr. Tucker joined Rheem in 1943 as a sales representative and moved into his first sales management responsibility with the company early in 1945. Until earlier this year when he became eastern region sales manager of the Rheem container division, he was stationed at the company's Sparrows Point, Md., plant.

A native of Baltimore, Mr. Tucker was graduated from Baltimore Polytechnic Institute.

Eaton Divisions Name Three New Engineering Sales Representatives

Cleveland Worm & Gear and Farval divisions of Eaton Manufacturing company have announced the appointment of new engineering sales representatives in Cleveland, Pittsburgh and Philadelphia to replace the Dingle-Clark company, which recently announced its retirement from the agency business.

Dingle - Clark had represented Cleveland Worm & Gear and Farval for the past 36 years. The three agencies which now represent the two Eaton divisions are being operated by former executives of Dingle-Clark in those cities.

In Cleveland, the R. V. Robison company in the Standard building becomes the exclusive engineering sales representative in this area. Mr. Robison had been in charge of the Cleveland office of Dingle-Clark, assisted by J. E. Peters and E. J. Gruber, who will continue with the new agency.

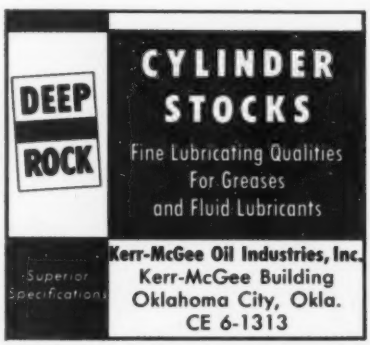
The J. P. Murray Co. has evolved from the Dingle-Clark organization in Pittsburgh. Located at 311 Ross street, the company was created by J. P. Murray, formerly in charge of the Pittsburgh office, as the exclusive engineering sales representative in this area. Working with Mr. Murray will be G. L. Engelbret, L. B. Abrams and T. F. Hatch—his associates in the former branch office.

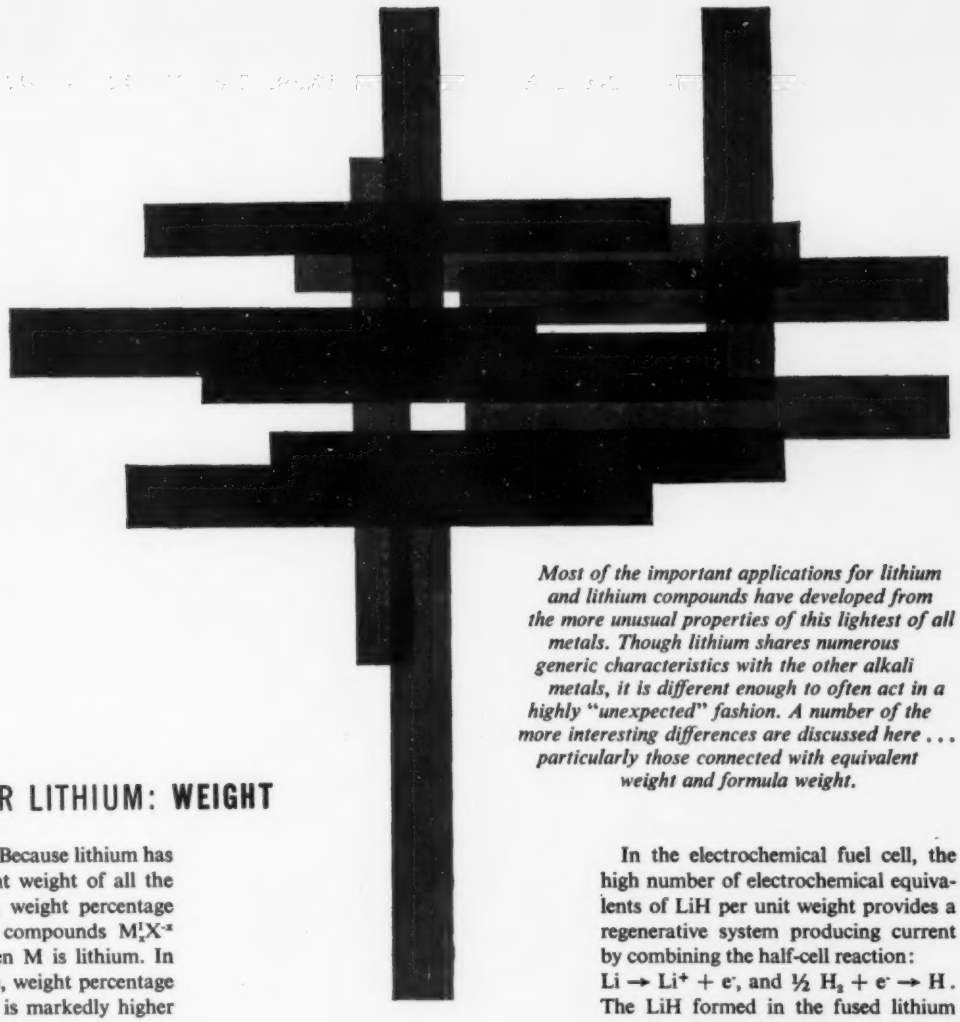
In Philadelphia, W. M. Stilwell formed a sales agency under his name in the Suburban Station building as an outgrowth of the former Dingle-Clark office to represent Cleveland Worm & Gear and Farval in this area. Associated with Mr. Stilwell are T. B. Ryan and S. G. Lugar who previously were in the employ of the Philadelphia office.

Wins Third Consecutive CMI Safety Award

For the third consecutive year, the tin can division of Vulcan Containers Inc., Bellwood, Ill., has received the Can Manufacturers Institute Award for Safety, it was announced at a special ceremony in the Vulcan plant recently.

The award, a bronze plaque presented to the division on behalf of the Institute by Vern I. McCarthy, Jr., president of Vulcan, was won by the division for completing all of 1959 without a lost-time or disabling accident. The division received similar awards in 1957 and 1958.





Most of the important applications for lithium and lithium compounds have developed from the more unusual properties of this lightest of all metals. Though lithium shares numerous generic characteristics with the other alkali metals, it is different enough to often act in a highly "unexpected" fashion. A number of the more interesting differences are discussed here . . . particularly those connected with equivalent weight and formula weight.

THE CASE FOR LITHIUM: **WEIGHT**

EQUIVALENT WEIGHT Because lithium has the lowest equivalent weight of all the alkali metals (6.94), weight percentage of the anion X^{-x} in compounds $M^{I}_{x}X^{-x}$ will be greatest when M is lithium. In $MC1O_4$, for example, weight percentage of available oxygen is markedly higher in *lithium* perchlorate . . . to the extent that on a volume basis, there is 29% more oxygen in lithium perchlorate at room temperature than in liquid oxygen at its boiling point.

Similarly, lithium hydride provides the highest content of available hydrogen (chemical reaction equivalents or gas) . . . lithium hypochlorite the highest content of active chlorine . . . and lithium nitrite the highest nitrogen content per unit weight of reaction mixture: $(MNO_2 + NH_4Cl \rightarrow 2H_2O + N_2 + MCl)$.

WEIGHT PERCENTAGE OF AVAILABLE OXYGEN

M	$MClO_4$	MNO_2
Li	60.1	58.0
Na	52.0	47.1
K	46.2	39.6
Rb	34.6	27.3
Cs	27.5	20.5

The relatively large number of moles of material per unit weight makes lithium salts ideal fluxes or liquid formers, and freezing point depressants. This can prove of considerable consequence in reactions facilitated by a liquid phase through which reactants can readily diffuse. Relatively small quantities of lithium salts added to high temperature electrochemical processes can depress freezing points, increase fluidity, decrease viscosity and, at the same time, increase electrical conductivity.

FORMULA WEIGHT Lithium hydride's low formula weight makes it ideal for two interesting applications . . . a heat sink and an electrochemical fuel cell. In the heat sink, the high heat of fusion of LiH per unit weight provides a thermal energy source in the conversion of thermal to electrical or mechanical energy.

In the electrochemical fuel cell, the high number of electrochemical equivalents of LiH per unit weight provides a regenerative system producing current by combining the half-cell reaction: $Li \rightarrow Li^+ + e^-$, and $\frac{1}{2} H_2 + e^- \rightarrow H$. The LiH formed in the fused lithium salt electrolyte of the cell is then thermally decomposed by a nuclear reactor to regenerate the reactants.

MORE TO COME The tale of lithium is neither quickly nor easily told. The material presented here constitutes the briefest of introductions. But if it has whet your appetite we can happily provide you with a great deal more of the same . . . long on facts and ideas, short on flim-flam, and complete with derivations and references. Just write for a copy of "Lithium vs. The Other Alkali Metals". Foote Mineral Company, 402 18 West Chelten Building, Phila. 44, Pa.

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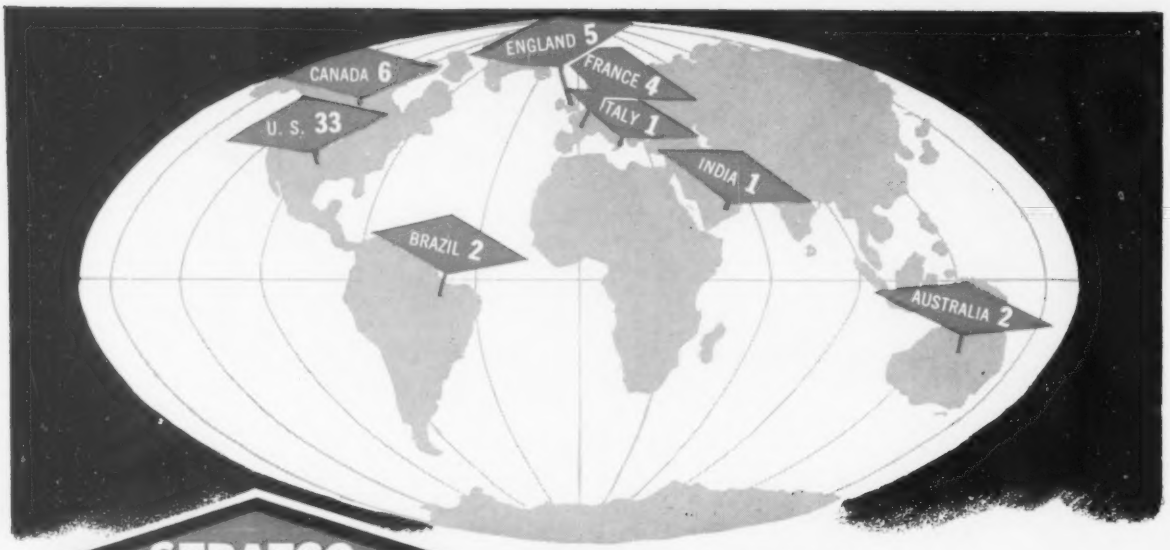

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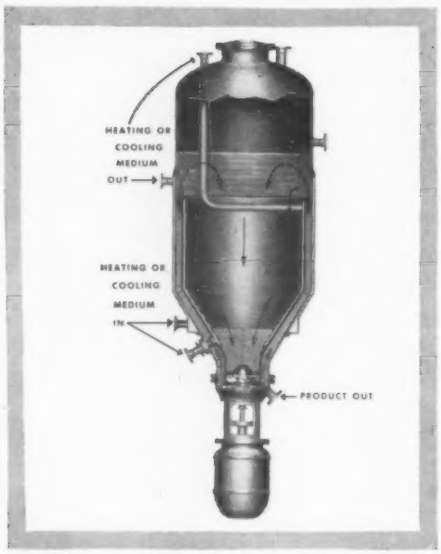

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- *. . . in less time*
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